Education and Technology Series

EDUCATIONAL APPLICATIONS OF COMPUTER NETWORKS FOR TEACHERS/TRAINERS IN ONTARIO

Principal Investigators
LINDA HARASIM
E. MARCIA JOHNSON

This research project was funded under the Ministry of Education, Ontario.
It reflects the views of the authors and not necessarily those of the Ministry.

The Honourable Sean Conway, Minister

Ontario

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EXECUTIVE SUMMARY

1. Introduction

This research project examines the potential of computer networks and conferencing systems to provide educational support to teachers and trainers in Ontario. The proliferation of computers in Ontario schools has placed teachers in a difficult situation. They are being asked to incorporate computers into the their curriculum, but the majority of Ontario's educational community has received little training in the area of computer applications in education. Teachers need in-service preparation to use computers, as well as encouragement and support in the use of other new information and communication technologies. Training resources and personnel are limited, and frequently those available are unable to respond adequately to the scope of the demand.

However, recent technological advances in the area of computer networks offer innovative potential for applications of computer-mediated communication to the field of education. Computer conferencing systems, electronic mail, and database management systems suggest such possible educational applications as computer-based distance professional education, on-line training, information retrieval, collegial collaborations among geographically distant educators, on-line software exchange, and newsletters for members of the educational community. These applications have valuable potential as learning strategies for maximizing educational resources such as training personnel, resources, educational software in Ontario, and for enhancing teacher or trainer collaboration locally and globally.

The study synthesizes existing knowledge of computer conferencing to indicate how it could address some of the current professional difficulties faced by Ontario teachers with regard to computers in the classroom. Strategies and guidelines for introducing such a computer-mediated learning approach into educational activities are provided, and recommendations for establishing a Computer Learning Network in Ontario conclude the report.

2. Statement of Purpose

This project was designed to investigate educational applications of computer networks and conferencing systems for teachers and trainers in Ontario, and has included two major objectives. The first objective is to produce strategies for the development of appropriate applications and educational resources to be distributed electronically to the educational community. The second is to develop guidelines for implementation of computer networks and conferencing systems as educational, communication, and information access and exchange mechanisms among teachers and trainers in Ontario. Recommendations for future research and development efforts in this area are also offered.

3. Illustration of Key Concepts

For the purpose of this report, computer conferencing is defined as the use of computers and software to link people across time and space for communication and sharing of resources. It resembles a group meeting or discussion but is held electronically. The effect of this facility is to allow discussions similar to those that might follow the presentation of a paper or lecture except that participants need not be assembled at the same place and time. Participants may review the proceedings, respond to specific messages, enter new information, ask questions of other participants or acquire data at any time of the day or night. By allowing non-simultaneous group meetings and exchanges (conferences), computer conferencing allows meetings or discussions to be held whenever necessary, and not just when possible. In order to provide some notion of how this new technology could function in practice, a hypothetical scenario for using computer conferencing in education is included here.

On-line professional development courses, in the form of "electronic in-service", could be mounted. A course could be offered on-line by an educational expert, and accessed by teachers throughout the province, via microcomputers in their classroom or home. Course materials could either be sent to participants through the mail, or downloaded from a central computer. The instructor would present information electronically, and then the members of the 'class' could discuss it, on-line, in a seminar form. This course would not begin at 9:00 a.m., nor would all students meet in one room, perhaps miles from home or work. Students would access course materials at their convenience, whether that be late at night, before breakfast, on weekends, or during the week. Nor would the class end at 5:00 p.m. with people returning home, and having little or no opportunity for follow-up or support when it was time to implement new knowledge or skills. In the electronic course, experts or instructors would remain available for the critical implementation phases. As new knowledge was integrated into classroom activities, on-going access to the instructor and other class members, through private messaging or conferencing, would be available for follow-up support.

4. Research Methodology

Since the areas of computer conferencing and networks are very new, little is known about their innovative educational applications. Furthermore, much of the research literature which is available concentrates on business or scientific communities or is primarily anecdotal. There is a dearth of empirical evidence upon which to base definitive conclusions.

For these reasons it was decided that the literature review for this study would be supplemented by assembling other data sources, including key informant interviews (key informants were defined as being educators interested in or familiar with computer conferencing); interviews with developers, or managers, of computer conferencing systems or networks; and active personal use of computer conferencing and networks. In this manner, it was possible to triangulate the research results, so that information obtained from one source could be compared and contrasted with that from another, to gain richer insights and more reliable findings.

5. Professional Development and Distance Education

While professional development courses and workshops have been the traditional strategy for responding to the professional needs of teachers, there are significant obstacles to overcome. These include unequal access to quality professional development activities around the province; unequal allocation of funds by school boards to professional development; lack of on-going peer contact; and the brief nature of professional development training. Moreover, while many teachers participate in professional development, upgrading, or skills development activities, on a short-term basis (often one or two days at a maximum), such factors as geographic isolation, family responsibilities, scheduling conflicts, or lack of appropriate educational programs or facilities limit their access to more comprehensive training. Especially in remote locations, highly qualified personnel may not be easily available to offer more long-term, intensive types of courses.

However, teachers demonstrate a significant interest in expanding their professional skills and knowledge, and many participate in distance education to supplement their learning possibilities. Although distance education has a wider meaning than correspondence study, it remains based predominantly on correspondence activities (using the postal system to send questions and answers, and assignments and grades). As such, traditional distance education can be characterized as a one-way communication medium with a variety of restrictions. These include the isolation of the learner; slow turn-around time for communication between the learner and teacher; and lack of access to educational resources. In addition, distance learners must be highly self-reliant, and very motivated, to overcome isolation problems.

Given the background of these existing problems, and the nature of both adult learning and new technologies, the potential of computer conferencing and networks is attractive. Computer conferencing brings the expert to the learner, wherever that learner may be located, and whenever that learner has time to study. It has the additional advantage of offering opportunities for self-directed learning, self-pacing in learning tasks, and participation in a number of different computer-mediated learning activities within the same day. Since computer conferencing is a new area, many educational applications could be imagined and attempted. Some of these ideas are explored in the next section.

6. Strategies and Guidelines for Educational Applications of Computer Conferencing

Computer-mediated learning can enrich and enhance the learning environment for teachers, but the mechanisms for its use must be carefully planned. A comprehensive approach would be to establish a provincial Computer Learning Network to enhance both educational and communication possibilities for professional development and adult distance education. Possible applications to be included in such a learning network follow, and contain suggestions specifically related to the introduction of computers into the classroom.

1. Educational Tool: Computer conferencing could be used as a tool to deliver educational resources, instructional resources, and professional support. Some examples could include an "Electronic University", electronic in-service, an on-line specialist forum, access to computerized course-related materials, or access to computerized learning resources.

2. Communication Tool: Computer conferencing could be used to encourage collegial networking, professional collaboration, and exchange of information. Such electronic activities could include peer support, special interest group exchange of information, professional association contacts, supplements to professional meetings and educational activities, a computer "hot-line" for ICON users, or joint collaborative projects.

3. Classroom Resource Tool: A variety of classroom resource tools could be accessed electronically, to support the teachers' classroom activities. These could include a teacher's on-line tool-kit, annotated software bank, on-line journals, electronic exchange, database access and information retrieval, and electronic bulletin boards.

4. Planning and Evaluation Tool: As well as being a valuable tool to enhance communication, increase educational opportunity, and provide access to a wider variety of information resources, computer conferencing and networks could assist in the planning and evaluation and processes of a variety of organizations. Such computerized activities could include program planning by providers of professional development, and arranging the logistics of meetings: assist in conducting meetings; advance member polling; input from absent members; enhancement of workshops or seminars, advance member voting, or evaluation of meetings and other professional activities.

7. Conclusions and Recommendations

This study began by situating the teacher/trainer in Ontario, within a context of change, as a result of the introduction of computers into schools. Computer networks and conferencing represent potentially cost effective strategies for maximizing scarce resources such as training personnel and materials, and offer a mechanism for democratizing access to quality professional development for Ontario teachers, regardless of location. Moreover, they are an appropriate medium for delivering adult education by facilitating self-directed learning, individualized instruction, and cooperative learning. An added dimension is that electronic communication can support the development of a learning society and lifelong learning, by establishing links between the home, the workplace, the community, and educational institutions.

On the basis of the research findings, the study concludes that:

- computer conferencing has major potential for the delivery of distance education and professional development to teachers in Ontario;
- computer conferencing represents a powerful medium to support collegial interaction, and the change process associated with the introduction of computers into the classroom;
- there is a need for such activities in the field; and moreover,
- it is feasible to implement a computer learning network in Ontario.

However, knowledge about facilitating on-line conferences is only beginning to be accumulated, and the area of electronic learning is at an even more initial stage of understanding. Research into the educational applications of computer conferencing must be done, and a number of key areas for follow-up research have been identified, such as the logistics of setting up a computer learning network; instructional design issues: the effectiveness of computer conferencing as a learning tool; issues involved in management of the electronic learning environment; identification of on-line resources; and the impact of the learning network on the educational community.

Information about these issues is critical to advancing existing knowledge of educational applications of computer conferencing. However, they can only be answered through the actual experience obtained from designing, implementing and evaluating activities in practice.

7.1. Recommendations

On the basis of our research, we recommend the following:

1. Establish a provincial Computer Learning Network in Ontario. Preliminary steps in this process would emphasize setting up pilot projects and research, studies to provide mechanisms for answering such questions as are outlined in the conclusions. These projects should also respond to current professional needs of teachers and trainers in the province. Strategies for these projects are outlined in subsequent recommendations.

2. Establish a pilot project to link ICON users in Ontario. The major focus of this project would be to provide teacher training and support mechanisms, and to study the use of the computer conferencing as educational and communication tools. The project should be established within one region or school board where a supply of ICONs already exists. Project-related costs would include the purchase of modems, payment of datapac and computer charges, and personnel salaries.

3. Establish a pilot project to link members of professional groups who have a clearly stated, self-identified need to communicate and participate in professional training related to computers in the classroom. The main purpose of this project would be to examine the use of computer conferencing as educational, or planning and evaluation tools. As with the pilot project to link ICON users, project-related costs would include the purchase of modems, payment of datapac and computer charges, and personnel salaries.

4. Conduct research into the applications of computer conferencing as an instructional medium, within the context of an Electronic University. At least two universities in Ontario are designing educational courses to be delivered using a computer conferencing system.

5. Conduct research into the development of educational resource support materials and tools. This research should include a needs assessment to identify which learning, classroom, or teacher resources are needed by professional development instructors and by teachers. Where necessary the appropriate software, programs, and utilities should be developed.

6. Exploit the capabilities of ECNO for housing the Computer Learning Network. Research should be conducted into the logistics involved in using ECNO for this purpose, such as developing policies and mechanisms for teachers or trainers to access ECNO nodes, up and downloading of educational resources, and establishing standards for storage and retrieval of data. This would involve standardizing on one microcomputer, and

developing file transfer mechanisms to facilitate the straightforward transfer of such files from a VAX node to the user's own microcomputer. In Ontario the standard should be the ICON or any OAEM microcomputer.

7. Locate the Computer Learning Network on one ECNO node, but have it accessible from any other node. OISE should be considered as an appropriate location for the Learning Network, where the recommended research and development activities could be undertaken and supported.

Chapter 1

INTRODUCTION

1.1 Overview

This report examines the potential of computer networks and conferencing systems to provide educational support to teachers and trainers in Ontario. While this communication technology is being implemented in business, research, and professional sectors, its application to education is only beginning to be anticipated. The study synthesizes existing knowledge of computer conferencing systems, to indicate how they could contribute to addressing some of the current professional difficulties faced by Ontario teachers who are trying to introduce computers into their classrooms. It then suggests strategies and provides guidelines for introducing a computer-mediated learning approach into educational activities.

There are two parts to the report: Part I contains the main textual body of the study. Part II is comprised of an annotated bibliography of over 100 entries. Part I begins by orienting the reader to the context of the research, and provides some possible scenarios to illustrate how computer conferencing systems could be used in education. These are followed by the background to the present study, including the conceptual framework and definitions of key terms used throughout the text. In the next chapter, research methodologies employed in the study are explained and discussed. These include an overview of selected literature; descriptions of key informant interviews and existing systems; and use of several conferencing and network systems. Chapter three provides a background discussion of issues in professional development for Ontario teachers, and focuses on their educational and professional support needs. An analysis of the problems with traditional strategies, such as distance education and professional development, used to resolve these needs is also provided. The discussions lead, in chapter four, to suggested educational applications of computer conferencing, by examining strategies for applying adult education concepts to computer conferencing, as well as pitfalls and deterrents to electronic learning. Chapter five provides specific guidelines for implementing computer conferencing systems. This discussion is set within a context of social psychological features, and software and hardware considerations for computer conferencing. The conclusions and recommendations for the study are contained in chapter six, and include detailed ideas for future directions in research and development.

1.2 Hypothetical Scenarios

Before starting the report proper, several hypothetical scenarios for computer networks and conferencing systems in education are included to introduce potential application strategies, and to provide some notion of how this new technology could function in practice.

- On-line professional development courses, in the form of "electronic in-service", could be mounted. A course could be offered on-line by an educational expert, and accessed by teachers throughout the province, via microcomputers in their classroom or home. Course materials could either be sent to participants through the mail or downloaded from a central computer. The instructor would present information electronically and then the members of the "class" could discuss it, on-line, in a seminar form. This course would not begin at 9:00 a.m., nor would all students meet in one room, perhaps miles from home or work. Students would access course materials at their convenience, whether that be late at night, before breakfast, on weekends, or during the week. Nor would the class end at 5:00 p.m., with people returning home, and having little or no opportunity for follow-up or support when it was time to implement new knowledge or skills. In the electronic course, experts or instructors would remain available for the critical implementation phases. As new knowledge was integrated into classroom activities, on-going access to the instructor and other class members, through private messaging or conferencing, would be available for follow-up support.

- Computer conferences among teachers in a particular region could focus on ways in which they conduct classes and integrate new materials into their practice. In many schools, a teacher of a specialized subject such as biology, music, or calculus might be the only representative of that discipline. Computerized conferencing could provide a forum, not now present, for peer-group discussion.

- Home university courses would be another on-line option. Hundreds of accredited courses, ranging from history to child psychology, could be available through an "Electronic University". Although correspondence courses have been the traditional alternative for part-time adult learners, they do not offer immediate feedback between instructor and learner. With an Electronic University, although students and instructors could be working at different times and in different parts of the country, the university would always be "open". In addition, teachers could locate ideas for future classes by tapping into:

- A program bank of educational software including evaluations, comments, and implementation suggestions from other classroom teachers;

- A teachers "tool-kit" offering ingredients such as: a database of curriculum suggestions and experiences from other teachers; quizzes; tests; exams; recommerded programs and software; local databases; and class management instruments, such as electronic agendas, class plans, or attendance recorders.

These suggestions, and others, are only a few of the possibilities which could be imagined for computer conferencing and networks. However, general knowledge about how to implement and use these new technologies is sketchy, and it cannot be assumed that electronic learning and its implications can be predicted easily. This report does not attempt to provide the answers to what are very complex problems, but instead examines the potential of computer conferencing for educational applications, identifies a number of important issues in professional development and distance education for teachers, and suggests strategies and guidelines for implementation. From these discussions, future research directions are also recommended.

1.3 Background to the Study

The proliferation of computers in Ontario classrooms has placed teachers in a difficult situation. They are being asked to incorporate computers into the classroom environment and the curriculum, but the majority of Ontario's educational community has received little training in the area of computer applications in education. Teachers need in-service preparation to use computers, as well as encouragement and support in the use of other new information and communication technologies. Training resources and personnel are limited, and frequently, those available are unable to respond adequately to the scope of the demand.

However, offering on-line training, professional development, and support through a computer conferencing system has significant potential for reaching large numbers of learners throughout Ontario, and for maximizing available training resources. Computer conferencing also offers a cost-effective strategy to maximize scarce resources such as training personnel and materials, to democratize access to expertise across the province, and to encourage an equitable sharing of knowledge - without compromising the quality of the learning experience. The application of computer conferencing to education can also overcome geographical constraints (the need for the educator or student to travel) and time constraints. As Cross (1983b) notes, computer conferencing brings the expert to the student, wherever that student may be located, and whenever that student has time to study. Computer conferencing has the additional advantage of offering opportunities for self-directed learning, allowing time for thought in organizing reponses, self-pacing in learning tasks, and participation in a number of different conferences or learning activities within one day.

In addition to the advantages of flexibility and access offered by computer conferencing, another significant and compelling benefit can be provided - namely, an environment to encourage social interaction among learners. Group learning, peer discussion, and cooperative learning have been found effective strategies in adult education. The consideration of computer conferencing systems, moreover, is particularly appropriate for teachers, given not only their on-going training needs, but also their access to computers in the schools and (in some cases) their homes.

1.3.1 Statement of Purpose

This project was designed to investigate educational applications of computer networks and conferencing systems for teachers and trainers in Ontario, and has included two major objectives. The first objective is to produce strategies for the development of appropriate applications and educational resources to be distributed electronically to the educational community (chapter 4). The second is to develop guidelines for implementation of computer networks and conferencing systems as educational, communication, information access and exchange mechanisms among teachers and trainers in Ontario (chapter 5). Future directions for research and development efforts in this area will be offered in chapter 6.

1.3.2 Conceptual Framework

Computer conferencing systems have become increasingly acknowledged as key tools in research, collaboration, and organizational decision-making in such fields as science, technology, medicine, law, and business, although the potential for educational applications is only beginning to be investigated. In this report, computer conferencing is considered for its potential to deliver distance education and professional development activities to teachers, and to enhance collegial networks at the local, provincial, national, and international levels. As Gerber (1983) notes:

> whether used to seek information and advice, air opinions, or simply chat, the newest tool for facilitating all types of connections among people is the computer network. Users can become on-line neighbors who can transcend time and distance, access vast funds of information in network databases, and also establish satisfying personal and professional relationships. (p. 12)

Computer networks and conferencing systems offer a potentially effective and efficient medium for supporting professional development and collegial exchange among teachers, and could be particularly valuable in supporting the introduction of computers into Ontario classrooms. As is outlined in this report, computer conferencing can be employed as a strategy to:

- make optimum use of trained personnel available to teach teachers or trainers;
- provide learning opportunities to small communities and to learners who are physically or demographically isolated;
- facilitate communication among educators, and to encourage information sharing and collegial exchange at the local, provincial, national, and international levels through the development and use of databases and computer conferencing;
- encourage the use of technology in professional development, and support the introduction of computer technology into the classroom;
- support teachers in responding to the change process associated with the introduction of computers in the classroom;
- meet the needs of teachers or trainers as adult learners by providing opportunities for professional development.
- offer a medium for other forms of continuing education and adult training;
- apply electronic linkages between the home, the workplace, the community, and educational institutions.

1.3.3 Definition of Terms

1. Human Networks: Human networks are concerned with communication and sharing of information between people and, as such, contain at least four aspects of social communication processes.

   First, communication assumes a shared social system. In other words, there must be at least two people involved in the communication, both with their own expectations and intentions.

   Second, it must be understood that communication consists of an on-going, dynamic social system in which each action can be viewed simultaneously as both cause and effect.

   Third, most communication theorists believe that both verbal and non-verbal communications are part of the same system, naturally occurring together.

Fourth, while the content of communication must be considered as being extremely important, the means of exchanging messages may be critical in defining relationships, particularly in terms of the balance of power that exists between participants (Wrightsman & Deaux, 1981, p. 127). As will be illustrated in this report, all of these features of human communication have important implications for computer conferencing systems research and applications.

2. Computer Networks: Tanenbaum (1981) has defined the term "computer network" to mean

> an interconnected collection of autonomous computers. Two computers are said to be interconnected if they are capable of exchanging information. The connection need not be via a copper wire: lasers, microwaves, and earth satellites can also be used. By requiring that the computer be autonomous, we wish to exclude from our definition systems in which which there is a clear master/slave relation. If one computer can forcibly start, stop, or control another one, the computers are not autonomous.... Nor is a large computer with remote card readers, printers, and terminals a network. (p. 2)

In other words, if a terminal with no capabilities for local processing ("dumb") is accessing a remote computer, then this type of communication cannot be considered computerized networking. However, using the software capabilities of a stand-alone microcomputer to do local information processing and then, sharing resources with other computers is true network communication.

3. Computer Conferencing: For the purpose of this research, computer conferencing has been defined as the use of computers and software to link people across time and space. Cross (1983b) has observed that

> computer/tele-conferencing is a system which enables two or more individuals at two or more locations to communicate. Without having to interrupt their work schedules and without having to pay for costly travel, these individuals can exchange information and learning aids. Through keyboard terminals, printers, and telephone lines, participants access a common computer for extremely efficient, direct communication. (p. 29)

Computer conferencing resembles a group meeting or discussion, but is held electronically. The effect of this facility is to allow discussions similar to that which might follow the presentation of a paper or lecture, except that participants need not be assembled at the same place and time. The temporal relationship of exchanges is the most apparent difference between computer-mediated communication and face-to-face meetings. In a computer conferencing system messages are exchanged asynchronously, and stored until a participant reads them and replies. Participants may review the proceedings, respond to specific messages, enter new information, ask questions of any participant, or acquire data at any time of the day or night. By allowing non-simultaneous group meetings and exchanges (conferences), they permit meetings, exchanges, or discussions to be held whenever necessary, and not just when possible. Each conferee (participant) can view and interact with text documents on the system; they can access, read and respond to these communications at any time.

Some general features of computer conferencing systems include text editing (either individual or group), sophisticated searching capabilities for conference items, access to external databases (on some systems), and electronic messaging. In addition, computer conferencing systems usually maintain a permanent record of proceedings during the course of a conference, thus serving as a type of electronic filing cabinet. Another important feature of computer conferencing is that, unlike Bulletin Boards, it provides different ways of structuring the communication. For example, all communication about a particular topic or theme would be stored together in the conference, so that participants could pick and choose items of personal interest rather than simply read whatever message happened to be next (as would be the case with a Bulletin Board).

4. Electronic Messaging: Messaging refers to the use of computers and specialized software, for the exchange of individual or group-specified communications. It is a more private means of exchanging information than computer conferencing, since messages are sent by one person, and only specified recipients can read them. Messaging can thus be characterized as one-to-one, or one-to-many, communication. Most messaging systems include such features as confirmation of delivery, editing, retrieval, searching, and forwarding messages to other users of the system. Also available on many systems are "distribution lists that allow a single message to be transmitted automatically to a collection of recipients. These are similar to distribution lists on office memoranda" (Newell & Sproull, 1982, p. 845). Electronic messaging does not support any structuring of communication as do computer conferencing systems. Messages are sent and stored sequentially.

5. Bulletin Boards: This software tool is similar to electronic messaging, but instead of communication being private, messages are sent to a publicly accessible mailbox and can be read by an entire community of users. Bulletin Boards differ from electronic messaging distribution lists in that they are intended to be read by a wide audience, which has not been identified by name. Furthermore, unlike computer conferencing (but like electronic messaging), Bulletin Board items cannot be structured according to topic or theme, but are stored and read in a linear, sequential fashion.

6. File Transfer: "A file transfer tool is used to copy from one computer to another a file, which is a stream of data bits" (Newell & Sproull, 1982, p. 846). In this fashion, information stored in one computer can be sent to another or retrieved. Most file transfer tools also include extensive integrity checking mechanisms to ensure that no bits are lost in the transfer.

1.4 Summary

It can be seen that there are overlapping functions of messaging, conferencing, and bulletin boards, but the most important distinction is that conferencing provides a structure to communications which is found in neither messaging nor bulletin board systems. Also, both conferencing and bulletin boards provide public forums for exchanging comments and ideas, while messaging is usually intended for more private communication. Network communication refers to hardware and software combinations which have been established to facilitate the sharing and transfer of information from computer to computer, and must include file transfer tools.

Having provided an overview of the research problem, purpose, and relevant terms, the report will now describe methodologies used in the study.

Chapter 2

2. RESEARCH METHODOLOGY

2.1 Overview

This chapter will describe in detail the research methods employed in the study, and will provide a rationale for their use. Since the areas of computer conferencing and networks are very new, little is known about their innovative educational applications. Furthermore, much of the research literature which is available concentrates on business or scientific communities or is primarily anecdotal. There is a dearth of empirical evidence upon which to base definitive conclusions.

For these reasons it was decided that the literature review for this study would be supplemented by assembling other data sources, including key informant interviews (key informants were defined as being educators interested in or familiar with computer conferencing), interviews with developers or managers of computer conferencing systems or networks, and active personal usage of computer conferencing and networks. In this manner, it was possible to triangulate the research results. In other words, information obtained from one source could be compared and contrasted with that from another to gain richer insights and more reliable findings. It is important to stress that some of the analysis and synthesis techniques were innovative, and intended to capture the maximum information from essentially qualitative data. Furthermore, these methods could have implications for future research.

In the following sections, a review of selected literature will serve to introduce some of the more important concepts and problems associated with computer conferencing and networks. After this general introduction, research information more specific to the area of education will be discussed within the framework of key informant interviews, conferencing and network system descriptions, and conferencing, network, and messaging participation by the principal investigators.

2.2 Literature Review

A summary of selected literature and an analysis of issues related to individual and group processes in adapting to computer-mediated communication (computer conferencing systems), is provided in this section. The focus is on factors related to the acceptance or rejection of these systems, and why some people become enthusiastic participants while others refuse to sign on. Issues examined here were selected for their relevance and applicability to distance education and professional development application for adult learners. The review concentrates on evaluations of several computer conferencing systems such as EIES, COSY, CONFER, FORUM and COM, and discusses five major issues:

1. determinants of use;
2. the group context;
3. size of the active group
4. evolution of user behaviour;
5. help features;

2.2.1 Determinants of Use

"Determinants of use" means explaining or predicting acceptance of a computer conferencing system. A number of studies and reports on factors affecting usage of computer conferencing indicate that social, not technical, factors were the primary determinants of initial system acceptance. Hiltz (1984) in evaluating the EIES system concluded that it was the motivation of participants, and their location within a particular social context, not hardware or software characteristics, which were primary determinants of initial system acceptance. In his study of management information systems, Lucas (1975) reached a similar conclusion. Based on data from 2,226 users in 16 companies, he observed that concentration on the technical aspects of a system, as opposed to either organizational behaviour problems or end-users of the system, are reasons for most information system failures.

"Pre-use expectation", that is the participants' estimates of their on-line time committment, before ever using the system, was found by Hiltz (1984) to be the strongest predictor of use. While already knowing some prospective system members on a personal basis was found to be a correlate, other factors accounting for pre-use expectations have yet to be determined. For example, prospective users may have a number of prejudices that colour their view of the system before they ever try it. These could derive from readings, conversations, associations, or past experiences. However such expectations are formed, Hiltz observes that the practical implications are clear. If prospective conferencing participants do not expect to use the system regularly, it is probably not advisable to try to put them on-line. From these studies, we can conclude that social factors bear a critical role in how a prospective user reacts to a conferencing system. Moreover, two factors -- expected use of the system before signing on, and number of conferencing group members known before use -- correlate with the amount of time a user will spend on-line (and thus with "success").

2.2.2 The Group Context

Evaluations of computer conferencing systems have identified a number of factors accounting for variations in activity, and apparent success of group computer conferences. Hiltz (1984) attempted to determine which (if any) group characteristics were strongly associated with success in using the system. She defined "user group" as a complex variable which included differences in the following attributes:

- nature of the task;
- size and social organization of the on-line research community;
- leadership effort and style (or lack thereof);
- special software features;
- differences in initial attitudes and prevailing norms among group members. (p. 71)

"Success" was measured by correlating the number of user hours on-line and subjective satisfaction with productivity gains as a result of using the system. Hiltz's evaluation found that:

1. The least successful groups had the smallest number and proportion of users demonstrating enthusiasm for the system before ever signing on. A sufficiently large number of active members was never mobilized to sustain a satisfying group interaction process on-line.
2. Intellectual competition within a specialty appears to stimulate use of the system; other types of competition may hinder it.
3. The more successful groups tended to have the largest proportion of potential pioneers in new research areas.
4. The amount of on-line activity by the leader was strongly related to the success of the entire group.
5. The social context was found to mediate the impact of the new technology. The same technology was perceived differently, and had a greater or lesser probability of being accepted, depending on the nature of the user group to which a person belonged, including its values and its leadership. For example, the least successful groups were most likely to feel distracted by the mechanics of using the medium and to find the system itself to be "boring" or "frustrating".
6. Although users typically joined a specific on-line group, as they gained experience they tended to communicate with members of other groups, and to join other conferences. Eventually, distinct user groups become overlapping networks. Interesting and well-led conferences thrived, grew, and attracted new members from other groups while other conferences essentially grew moribund. (1984, p. 89)

Hiltz (1984) compares user groups in computer conferencing to subcultures in a society, and concludes that "being a member of one group (subculture) rather than another seems to shape the experience of the members and quality of their (electronic) life" (p. 90).

2.2.3 Size of the Active Group

The notion of "critical mass" has been raised as a factor in successful conferencing (Hiltz and Turoff, 1978; Davie, 1984). The argument is that there must be a large enough number of active members of a user group, signing on frequently (several times per week), to generate motivation for all members to access the system and participate. Otherwise, the pattern of daily sign-on necessary for conferencing to be an efficient communication mode is negatively rewarded by having no new items waiting. In such cases, users quickly become discouraged.

An experiment with the COSY system also indicated a need for a critical mass of users (Waldron, personal communication, December 1984). Hiltz (1984) clarifies, however, that "it is 'effective size' in terms of active members that counts, not nominal size. In fact, having nominal members who are inactive is undoubtedly harmful to the group, since they do not return the messages sent to them" (p. 85). Indeed, Tracz (1980) described the sense of letdown he experienced when, after having sent a number of messages, he signed on to the system to find "no message waiting".

Hiltz (1984) cites Palme's discussion of group size in his study of the COM conferencing system. Palme agreed that effective group size was important, although the optimal size varied according to the nature of the task. While in one report he predicted the number 30 as the threshold for successful conferencing, using the COM system, in a later report he was more general:

> One aspect which should be studied more is the optimal conference size. Our experience is that a computer conference seems to work best in group sizes between ten and eighty participants in COM. (p. 86)

2.2.4 Evolution of User Behaviour

Although attention to the design of the user interface is reported by many developers of computer conferencing, to be the key to a successful conferencing system (Mason, 1985; Mayer, 1985), as yet, too little attention has been paid to the evolution of user behaviour. Mason (1985) offers a typology (or classification) of user types, but does not address the issue of user behaviour changes or maturation over time. This issue was addressed in the EIES study, and Hiltz (1984) found that as users gain more experience with a conferencing system, their pattern of usage, preferences related to system features, and reactions to the system change. The data indicated that there is an "evolution", or pattern of change, towards greater complexity, specialization, and diversity of user behaviours. Hiltz (1984) offers the following schema of the stages of learning a computer conferencing system:

1. Mastering the basics: 2-5 hours
2. Feeling comfortable: 5 hours
3. Learning advanced features: up to 30 hours or more
4. Creative (system) mastery: those with 100+ hours on-line. (p. 93)

First-time users generally feel awkward and inept with the system, in terms of learning the mechanics and using electronic communication. They express scepticism as to the usefulness of the system, frequently doubting that it really works, expressing fear and lack of confidence that they can master its complexities. Essentially, new users need reassurance that their communications are actually reaching the intended people. A successful first experience in sending and receiving a message acts as an impetus to participate. In the EIES evaluation, when an account was established, a "greeting" was sent from the user consultants, and a reply requested from the new user. This served several purposes: (a) it ensured that all new users would have a message waiting; (b) it reassured new users that the system actually worked; (c) it provided a concrete objective for the first session (to successfully send a message); and (d) the content of the first message allowed the researchers to capture some of the feelings of new users.

Hiltz (1984) notes that an initial "successful" experience seems critical to how a system is perceived.

> If [the users] do not manage to successfully send and receive messages during their first 20 to 30 minute session, they may become so frustrated that they hang up and never try again. If they are reassured by receiving some response to their first attempts at communication, they generally proceed on to spend a few hours learning the basic mechanics of the system. (p. 96)

Differences of opinion among system designers exist as to whether a menu-driven or command-driven interface is more suitable for users. Mayer (1985) states that from the outset the COSY developers decided against a menu-driven interface as being too tedious and repetitive, and as not necessarily contributing to the ease of learning a system (p. 24). On the other hand, Hiltz's research indicates that the beginning user sees a need for relatively few features, and favours a menu-driven interface. In addition, support for a menu as a beginning interface grows stronger the more time a person spends on-line (Hiltz, 1984, p. 122). Hiltz speculates that using a menu appears to have the cognitive effect of helping the user form a mental map of the structure of the system and with experience, EIES users grew to appreciate the option of the more active command mode. With both the EIES conferencing system and the iNet network system, users can choose their own particular interface style. For example, iNet permits users to select either a menu, a menu/command combination, or command mode interface, but perhaps more importantly, they can change their interface style at any time.

With increased volume and complexity of interactions, users come to feel that a wider variety of capabilities is necessary, and appreciate a command-driven interface which allows them to create their own commands and organize their communication more efficiently. They become proactive with the system design, requesting new features and exploring the system. In the EIES study, many of the experienced users with 100 or more hours on-line began to describe themselves as system addicts. In other words they were using the conferencing system for more than its communication functions; they were also using it for stimulation and enjoyment.

Another major problem of electronic communication is "information overload". Frequently there is simply too much material to assimilate. However, the EIES study found that feelings of overload decrease among users spending most time on-line, indicating that those most experienced have learned to cope with the wealth of material available to them.

2.2.5 HELP Features

One of the most important determinants of user acceptance of a conferencing system is the nature and amount of help available, to ease and support initial system usage, and to master more complex software features. All computer conferencing systems provide some written documentation, but there is wide variation in quality. The COSY system, for example, was designed to be so simple that written documentation was not needed (Mayer, 1985, p. 24). In fact, Mayer states that many of the current 700 COSY users around the world learned to use the system without a manual (p. 33). While a manual exists, it offers only the minimal instructions necessary to begin to use the system. Mayer reports that

> it was decided to make the system easy to learn by minimizing the number of available commands. This limit was arbitrarily set at ten. It was this constraint that lead to COSY's more innovative features, and the average user rarely uses even half-a-dozen commands in a session, although the total number available is far more than ten. (p. 25-6)

The CONFER system user interface was similarly intended to encourage a self-help style of interaction. However, through experience, the system personnel found that users prefer a hard-copy document to support their use of the system.

EIES provides a substantial manual, but their evaluative research indicates that most users do not read lengthy printed materials. The EIES system employed an extensive and up-to-date on-line explanation file, but it appeared to intimidate many users (both novices and experts). Much more popular as a source of on-line help was the human user consultant, and Hiltz (1984) observes that "if one were forced to live with a single source of help, then the human user consultants appear to be the best choice" (p. 118). Human consultants serve both to provide the extensive "hand-holding" new users appear to need, and to assist the more experienced users in exploring and mastering the system. The COSY system does not have on-line user consultants, but due to demand their introduction is being considered.

This review of the literature, while not comprehensive, offers some indication of factors contributing to user success with computer conferencing systems. These factors provide a context for this study only insofar as they deal with conferencing in general. Research specifically relevant to education is now described.

2.3 Key Informant Interviews

A total of 36 informants were interviewed for this study. In addition, we conducted two short workshops with a total attendance of ten teachers, board of education computer consultants, and professional development instructors. Of the 36 respondents, 19 were identified as key informants. Key informants can be described as "individuals who possess special knowledge status, or communication skills and who are willing to share that knowledge and skill with the researchers" (Goetz & LeCompte, 1984, p. 119).

The identification of key informants was accomplished through contact with educators interested in, or familiar with, computer conferencing; contact with system managers and developers; literature review; and participation in a two-day workshop at the University of Guelph in January 1985. The workshop, entitled Computer Conferencing and Electronic Mail, assembled approximately 75 experts involved in computer conferencing research and applications in Canada, the United States, Britain, and Europe.

2.3.1 Key Informant Data Collection Instrument

The interview instrument was structured so that each participant would answer the same questions, yet open-ended to allow maximum flexibilty during the interviews. Our main purpose was to gather the most information without imposing restrictive, a priori, response categories. The research work of Kerr and Hiltz (1982) and Hiltz (1984) provided valuable guidance for the phrasing of questions and content areas to be included; however, it is important to remember that our intended audience will include school personnel whose interests and needs are different from those in many previous studies. By including questions about (for example) the essential ingredients or pitfalls of conferencing systems for professional development and distance education activities, we tailored the data collection to our specific audience. In total, there were 18 questions asked of each person, and interviews lasted approximately 1 to 1 1/2 hours. The research instrument can be referenced in Appendix D.

2.3.2 Nature of Data Collected

Interviews with educators provided a rich source of information for the study. Since both researchers took notes during the interviews, it was possible to assure higher internal validity of the data. Analysing the data was not a straight forward process, however, as the responses were complex, and therefore could not be coded and accommodated easily by statistical analysis programmes. Moreover, we believed that it was undesirable to reduce the interview responses to simple categories, since too much valuable information would be lost.

2.3.3 Data Analysis

Using techniques for handling qualitative data, as described by Miles and Huberman (1984), the interviews were transcribed so that all responses for each question were grouped together. The transcribed notes were carefully read and, through induction, emerging constructs identified. However, since each interviewee may have included several ideas in response to a single question, the task of manually separating and organizing the constructs would have been onerous.

For example: one of the interview questions asked people to state their reactions to the specific conferencing system they had been using. They were also asked to describe what had worked, and what had not been successful. One respondent cited poor documentation; software that was difficult to use; the need for better keyword searching; the need for "threading", to follow the course of a conversation through the mass of conference items; the desirability of allowing anonymous comments; and the belief that if people were geographically too close, the system would be less useful than if they were situated at more remote sites (where traditional means of communication, such as the telephone or mail were either too expensive or too slow). Overall, the person was enthusiastic about the use of conferencing, in spite of some negative reactions.

For this particular question, the content themes documentation, software, hardware, and social psychological factors were identified. These themes appeared elsewhere in the data as well, thus providing some relationship between selected questions. However, since interviewees may have included one or more themes in their response, and within each theme there may have been several subsets of the main idea (for example, within "software" a person may have mentioned text editing and searching of key words -- two quite different aspects), it was important that not only the individual themes, but also their subsets be identified and separated in order to obtain an in-depth understanding of the data.

2.3.4 Database Management as an Analysis Tool

One possibility for organizing and sifting through interview data which incorporates multiple themes and subsets is the use of database management. Powerful and sophisticated software packages for microcomputers are available now, and are becoming increasingly easy to use. For this research, the package dBASE III and an IBM-PC computer with data transfer capabilities to the main OISE VAX 11/750 computers were selected. In this manner, database construction and data analysis occurred on the microcomputer, with the results being stored on the VAX and printed on its laser printer.

2.3.5 Construction of Database

For the task of separating themes and subsets within responses, the database management system was an invaluable tool although the initial work of developing data structures, flexible enough to handle our information requirements, was somewhat time-consuming. The data organization for the question cited above (reactions to a particular conferencing system) is contained in Appendix C, and an explanation for this particular question follows.

Each person's responses could be linked to the original interview form by identification number, and their overall reaction to the system was coded as positive, neutral, or negative. For each response, the presence or absence of a comment within any of the concept themes was noted by an indicator variable (true or false). Thus, if a person had offered comments about documentation, software, and hardware, the indicator variables Q2DOCU, Q2SOFT, and Q2HARD would be set to "true", while Q2SP (representing social psychological factors) would be "false". The text of the person's response was then stored in a character variable (for example, Q2DOCUCOM -- question 2, documentation, comment). One of the advantages of database management systems, particularly relational systems (such as dBASE III) which allows the electronic "cutting and pasting" of information from several different files, is that they permit great flexibility in manipulating complex, or "messy" data.

2.3.6 Report Production

Once the database had been constructed, it was possible to generate a variety of reports. For example, extracting all software comments from all questions was accomplished easily by typing a couple of command lines. Alternatively, the frequency of response themes within particular questions could be determined and compared across questions, or the nature of a specific person's responses could be examined. Thus, if negative comments were made about software features in one question, it was possible to determine if similar responses appeared elsewhere. What is important to understand is that the data, once structured and entered in the computer, can be pulled apart and recombined in almost limitless ways.

After having explored the responses to questions, it was possible, through interactive dialogue with the database program, to produce reports. Further, reports were formatted according to our specifications, directed into separate files, and uploaded to the OISE VAX computer.

2.3.7 Results

The results of the analysis proved very interesting as we were able to extract, in a systematic manner, far more information from our data than would have been possible manually. The results of the interviews are summarized below, and the both the documentation for the database and sample reports can be referenced in Appendix C.

TABLE 1
Profile of Key Informants

Position	Experience	Sex
14 - Professor	11 - Lots	13 - Men
2 - Dist. Ed.	4 - Some	6 - Women
2 - Managers	4 - Speculator	
1 - Librarian		

While most people cited professional reasons as their main motivation for using conferencing, many also cited personal reasons (curiosity, or the desire to build personal networks). Their comments about computer conferencing are summarized as follows:

1. Almost every person interviewed believed that computer conferencing systems are valuable. They are efficient, save time, and are conducive to group work. The majority of informants believed that the potential of conferencing for distance education and professional development was "good" to "excellent". However, many people mentioned that conferencing should be one of a variety of learning activities, not used as the exclusive mechanism for instruction. There is a need for specific, well-structured problems for students to solve, and the moderator must ensure the continuity of discussion topics. Only one person believed that database access was not desirable with all others, stating that it was one of the key ingredients for successful electronic courses.

2. Suggestions for successful conferences included the need for rapidity of feedback, "humanized" communication, and professionally useful information.

3. There is a need for better system documentation, pre- and inservice training, and simple-level help commands.

4. There is a need for people to acquire specialized social skills for computer conferencing. For example, interviewees reported that some users tend to monopolize conversations, or alternatively, do not use the system effectively if there are deadlines (the telephone or personal meetings works much better), or if they are situated geographically close. Several people mentioned that lack of typing ability was a limitation.

5. The most frequently mentioned reason for ceasing to use conferencing was that specific tasks had been completed (projects ended). However, cost and difficulties adapting to the system (for either software or social reasons) were also cited.

6. Software problems cited most often were concerned with the generally poor quality of conferencing system text editors, the lack of powerful mechanisms for following the "thread" of a conversation, and the need for better keyword searching capabilities. Several people stated that file transfer software was needed so that information could be stored and manipulated locally, and then up or downloaded to the computer housing the conferencing system.

7. There were fewer comments about hardware than about other features. However, those mentioned included the importance of access to terminals, and the need for conferencing system redesign to be compatible with microcomputer capabilities. Additionally, several people expressed the view that system design needs to be user-driven or, in other words, incorporate formative feedback from users. While some of the informants had been hired to conduct specific evaluations of conferences, most reported that systems they were using did not solicit evaluative user feedback.

While our interviews corroborate many of the findings of the literature, especially the importance of social and psychological factors, we also received many comments about software features. This finding could be at least partly attributed to the fact that most of our key informants were experienced computer users, and had high expectations for system performance.

2.4 Description of Existing Systems

The systems investigated during this study were COSY (University of Guelph), CONFER (University of Alberta), EDUCOM (Princeton, New Jersey), the Electronic Information and Exchange System (EIES, New Jersey Institute of Technology), FORUM (University of Alberta), and iNet (Ottawa, Ontario). Since these descriptions are lengthy, they have been included in

Appendices A and B of the report. The data collection instrument itself can be referenced in Appendix D.

Generally, we found considerable overlap in the types of functions provided by each system and in their assumptions about access and usage. Most existing conferencing systems have been developed and operate under the assumption that the software will be stored on a large, central mainframe computer, and that users will access this machine remotely. Provisions for text editing, composing and forwarding of messages and conference items, are available on the central computer and must be used there. This situation is not surprising since most conferencing systems were developed at a time when it was common to access computers through "dumb" terminals, and microcomputers were unavailable or scarce. However, few conferencing systems have yet recognized that people will be increasingly using their own local microcomputers with associated software capabilities. In other words, most existing conferencing systems neither recognize nor exploit the local computing power which has become widespread with the appearance of microcomputers in the workplace and home. This failure has important implications for conference designers and future network development.

2.5 Conferencing and Network System Usage

As part of the research, the principal investigators participated in several electronic conferences on COSY and FORUM. In addition, the messaging and network facilities of COSY, FORUM, iNet, and MAILNET were used. Appendix E contains examples of these interactions. Without question, the messaging facilities of MAILNET were easiest to use, because this software has been specifically designed to allow users to access their own local mail program, with the network assuming responsibility for translating the communication into the required message format of the recipient's computer. However, other software problems were so serious that it was almost impossible to use MAILNET. For example, the OISE "mailbox" would become jammed (usually by an outgoing message), thus preventing any messages from either leaving or entering our computer until the offending mail had been removed. Also, only in later software implementations were users informed that their messages had been successfully (or not) picked up by the network, although these notifications were obscure to say the least.

The network facilities of iNet were easy to use, and through a file transfer program on the OISE VAX, a variety of InfoGlobe articles were downloaded. However, the more advanced features of the commercial implementation had not yet been installed at the time iNet was being used, and thus such capabilities as group editing could not be evaluated. Envoy 100 (iNet's messaging facility) was very easy to use. The menu structure of iNet was somewhat slow and tedious to navigate; however, it is possible to redefine one's user interface to include the use of system commands.

COSY had a number of valuable features in its messaging system. For example, a sender would be notified that a communication had been received and read. However, it would have been far more convenient to compose messages or conference items locally, and simply transfer the files to the Guelph computer. The COSY text editor is a clumsy, line-oriented variety which made extensive corrections or formatting cumbersome. The conferencing system itself was easy enough to use, but, as was pointed out by many of the key informants about other systems, following the "thread" of a conversation was difficult.

FORUM was similar to COSY in its user-friendliness; it was easy to get started. However, more complex activities such as string searches required the location of appropriate commands in the manual. The messaging system available at the operating system level was quite powerful and easy to master. Moreover, having access to the messaging facilities of the University of Alberta was extremely helpful during the course of this research for maintaining fast, efficient, and cost-effective interactions with colleagues in Western Canada. A FORUM conference to discuss potential applications of computer conferencing was initiated through this project, and several valuable insights were shared through this link (see Appendix E).

2.6 Summary

The information gathered during the interviews has several important implications for this study. First, it corroborates much of the research literature, but points to a need for systematic study of the applications of computer network capabilities to conferencing research. In most of the studies which have been conducted, people have used "dumb" terminals to access mainframe computing facilities. By ignoring the processing capabilities of personal computers, mechanisms for facilitating local handling of computer files and for transferring locally processed information to a central computer, to be shared with others, are unknown. These software and hardware features are equally important as socio-psychological factors, and must be incorporated into the design of electronic distance education and professional development.

Chapter 3

ISSUES IN PROFESSIONAL DEVELOPMENT FOR TEACHERS IN ONTARIO

3.1 Overview

This chapter will provide an overview of existing problems in the areas of distance education and professional development. Its framework will lead to a discussion, in the following sections of potential applications of computer networks and conferencing, and to guidelines for conference organizers.

Teachers in Ontario are currently experiencing tremendous pressure to become computer literate, and to integrate computers into their classroom practice. Ragsdale (1982) defines computer literacy as "whatever understanding, skills, and attitudes one needs to function effectively within a given social role that directly or indirectly involves computers" (p. 12).

The integration of computers into the classroom involves major training and support for teachers, in order that this innovation can be adopted, and that teachers adapt to the change process. Within the context of this study, the change process is considered an adult education and planning issue.

3.2 Teachers and Educational Change

Fullan (1982) states two major issues involved in the process of teacher adoption of innovation.

1. What makes change work at the level of teachers is strongly related to what extent teachers interact with each other, and people providing technical help.
   Within the school, collegiality among teachers, as measured by the frequency of communication, mutual support, or help, was a strong indicator of implementation success. In fact, virtually every research study on the topic of educational change has found this to be the case. (p. 121)

2. The process of implementing change is a learning process and teachers are adult learners. (p. 119)

3.2.1 Collegial Networks and Adoption of Change

The group, or social, context of educational change is a major factor in the adoption of innovation. Fullan (1982) stresses the primacy of personal contact, and the need for collegial interaction, exchange, and discussion about the meaning of change, in order to learn to use an innovation as well as to judge its desirability on more information-based grounds. Quoting Werner, he states that "implementation is an ongoing construction of a shared reality among group members through their interaction with one another within the program" (p. 121). Yet the reality is that teaching has become a very privatized occupation with teacher isolation being characteristic. Fullan (1982) synthesizes Lortie's study on teachers to provide an important insight into the nature of their isolation.

> 1. Teacher training does not equip teachers for the realities of the classroom.
>
> 2. The cellular organization of schools means that teachers struggle with their problems and anxieties privately, spending most of their time physically away from their colleagues.
>
> 3. Partly because of the physical isolation and partly because of norms of not sharing, observing and discussing each other's work, teachers do not develop a common technical culture.... The lack of a technical culture, an analytic orientation, and a serious sharing and reflection among teachers create ambiguity and ad hocness.
>
> 4. When teachers do get help, the most effective source tends to be fellow teachers, and secondly administrators and specialists.... There is some indication that teachers desire more contact with fellow teachers. (p. 108)

The data from our interviews, with teachers and professional development personnel, echo Fullan's concern that there is not a strong context of collegial exchange among teachers. This has a major impact on how teachers relate to their profession, to the quality of their working life, and to the adoption of change. Without access to support systems and to a context of collective reflection and analysis about the adoption and implementation of change (such as introducing computers into the classroom), stress levels are high, and teacher attitudes and morale are critically affected. As Fullan points out, given these (and other) conditions, change can be a two-edged sword--either aggravating teachers' problems or offering some means of resolving them. (It appears to be far easier to do the former rather than the latter.) Interaction among teachers is a key ingredient for professional development. "Interaction about a change is necessary.... The lack of opportunity for teachers to reflect, interact with one another, share, learn, develop on the job makes it unlikely that significant changes will occur" (Fullan, 1982, p. 118). Yet, on the other hand,

> the more teachers experience the rewards of interaction, the more they will use the criterion of professional contact and development--satisfaction from the intellectual and practical benefits of helping, getting help, and sharing with other teachers--as a measure of whether to become involved in innovation. And make no mistake about it, focused teacher interaction is essential to large-scale successful change. (Fullan, p. 122)

3.3 Educational Change and Adult Learning

Adult education research indicates that there are certain 'teachable moments' when people are most likely to seek learning experiences (Knowles, 1970, p. 45). Waniewicz (1982) cites research that found that 83% of US adult learners identified some past, present, or future change in their lives as reasons to learn. These are usually related to major life change events (such as professional pressures), when an adult has the greatest need for new knowledge and skills. In Ontario, a recent study of adult learners indicated that for 44%, the purpose of learning was job-related (Waniewicz, 1982, p. 88). Similarly, in the U.S.A., 50% of the adult learners cite professional reasons for seeking adult education activities (Meierhenry, 1982, p. 20). In this context adults prefer course content to be accompanied by applications to specific work-related problems. Action plans, accountability strategies, and follow-up after training, help the process of integrating new learning. Moreover, according to Zemke (1981):

> learning opportunities. Just as stress increases as life-change events accumulate, the motivation to cope with change through engagement in a learning experience increases. Since the people who most frequently seek out learning opportunities are people who have the most overall years of education, it is reasonable to guess that for many of us learning is a coping response to significant change. (p. 46)

However, data on adult learning indicate that for many people, classroom situations are neither viable nor desirable. Distance, time scheduling constraints, or a general resistance to being in a classroom can interfere with traditional instruction.

The vast majority of teachers in Ontario may be defined as "non-traditional learners". While many teachers participate in professional development, upgrading, or skills development activities on a short-term basis (often one or two days at maximum), such factors as geographic isolation, family responsibilities, physical handicaps, scheduling conflicts, or lack of appropriate educational programs or facilities limit their access to more comprehensive training. Especially in remote locations, highly qualified personnel may not be easily available to offer more long-term, intensive types of courses. Moreover, adults frequently report that long lectures, periods of interminable sitting, negative feelings about authority figures, or the absence of opportunity to try out ideas in practice are highly negative factors (Zemke, 1981). If, however, the instructor plays a role of facilitator rather than authority figure, adults can learn well. They can also learn a great deal from respected peers.

For many teachers, the introduction and professional use of computers signifies a need for extensive training which might be satisfied through distance education. Distance education is defined here as: "any mix of learning activities and interactions between learner and peers and learner and instructor which is not dependent on regular, fixed classroom attendance and which takes into account those learners who live beyond the urban environment".

3.4 Problems with Distance Education

Teachers demonstrate a significant interest in expanding their professional skills and knowledge through the medium of distance education. For example, 31% of the registered participants in the Correspondence Education programs at the University of Waterloo are teachers (Knapper and Waslycia-Coe, 1982, p. 125). Although distance education has a wider meaning than correspondence study, it remains based predominantly on correspondence activities (using the postal system to send questions and answers, assignments and grades, etc.), and thus can be characterized as a one-way communication medium. The one-way character of correspondence courses can impose certain restrictions on the nature and the quality of learning.

1. Foremost is the isolation of the learner; interaction between the learner-teacher, and opportunities for sharing and discussing information with other learners are often limited. This is particularly exacerbated in rural settings, where opportunities for face-to-face meetings are rare.

2. Turn around time for communication between learner and teacher is significant and can negatively influence learning. If communication occurs primarily through the mail, delays of up to three weeks in each direction may occur, which is an insufferable waiting period for feedback.

3. Although telephone communication can ameliorate the situation somewhat, a great deal of time can be lost on non-productive communication activities. AT&T has estimated that on average, the chance of achieving a telephone connection to the right person on the first attempt is only 28% (Sharples, 1982), as over 1/3 of all calls are not connected due to busy lines or wrong numbers.

4. The isolation of the distance learner is compounded by a lack of access to learning and information resources, such as libraries. Moreover, overcoming information scarcity in rural or remote areas by distributing even the minimal materials required for a given course, incurs great expense and effort. At the Open University in Britain, for example, every course unit, case study, and supplementary unit is duplicated up to 5,000 times and distributed to each student in the course (Sharples, 1982). Altering or updating any of the documents can incur considerable additional effort and cost and in fact, most course materials, once developed, are used unaltered for at least three years (Bates, personal communication, 1985). In the area of computers such a lengthy period of using the same materials is impractical given the rapid pace of technological change. Moreover, despite these massive undertakings by the Open University, it has been impossible to provide access to all the learning resources a student may need, and learners in remote areas must do without.

5. The distance learner must be highly self-reliant, and both the learner and the instructor very motivated, to establish additional communication links to overcome isolation problems.

3.5 Problems with Professional Development

In the area of professional development, a plethora of other or overlapping problems also exist. The main impetus for professional development activities derives from Teachers' Federations, in cooperation with local boards of education. The Federations have a system of representatives at the school level (teachers who volunteer or are elected by their peers) who are responsible for polling colleagues to identify professional needs and interests, and for acting as the board contact. Professional development activities usually take the form of one-day seminars or workshops, either at the school or at other central, board-designated locations. The Federations also have lists of specialists and personnel who will travel throughout the province to deliver professional development activities.

While the Federations have worked hard to implement high-quality training around the province, and have influenced administrators in the boards to recognize the importance of these activities for teachers, during our interviews with organizers, providers, and teachers, a number of problems were identified.

1. Unequal access to quality professional development in the province exists, and the best professional development activities are predominantly in southern Ontario. Consequently, smaller more remote communities suffer.
2. Unequal allocation of money for professional development by school boards in the province is common. Some boards reportedly devote no funds to professional development activities.
3. Relatively few teachers can attend the really large conferences (such as ECOO) as financial support from the Federations is limited.
4. Teachers are very isolated both within their school and their subject areas. There is no mechanism for sharing the problems they confront professionally or, more importantly, sharing the solutions.
5. Professional development activities are very short term, usually lasting for only one day. Such short duration does not provide much possibility for behavioural changes in the classroom (on the part of the teacher).
6. Most professional development activities provide theory, with little emphasis on how to implement new ideas. Frequently teachers attend professional development activities to help overcome the "Monday morning syndrome" and want to take something concrete back to the classroom; However, only very simple ideas can be implemented without collegial support, and there is no follow-up support to teachers after they complete a professional development course.
7. Many professional development providers are content experts, but have little knowledge of adult educational techniques, or of how to present the material in the best way for teachers to integrate it. Computer literacy activities are particularly problematic, as the material is often too advanced for the beginner, and all too often focuses on teaching programming languages rather than addressing teachers' concerns about how to use the computer as an educational tool.
8. A recent evaluation of professional development policy and practice for teachers, in Ontario, observed that "present practice tends to be fragmentary and of an ad hoc nature. Little discussion and joint planning is under way to muster resources in support of recognized priorities" (Ontario Teachers' Federation, June 1981, p. 19).
9. There is little coordinated effort to assess teachers' needs with regard to professional development, to plan the activities, to monitor them systematically, or to assess the impact either on individual teachers or on the profession.

3.6 Summary

Given the background of these existing problems and the nature both of adult learning and new technologies, the potential of computer conferencing and networks is attractive. For, as has been illustrated throughout the report, one of the strongest features of electronic communication is its asynchronous nature. Learners no longer need to be assembled at the same time in the same location, but rather can communicate with peers and experts, or access information whenever it is most convenient. Moreover, since conferencing is a new area, many educational applications could be imagined and attempted. Some of these ideas are explored in Chapter 4.

Chapter 4

EDUCATIONAL APPLICATIONS OF COMPUTER CONFERENCING

4.1 Overview

In this chapter potential applications of computer conferencing to education are discussed within the framework of adult education theory. Strategies for applying the new technologies to distance education and professional development are suggested, with associated pitfalls and deterrents to electronic learning also being considered.

Certain characteristics of computer conferencing make it well-suited for adult learners. A distinction should be made, however, between computer-assisted instruction (CAI) and computer conferencing in the educational context. Cross (1983b), for example, states that CAI has provided a dismal view of computer-related instructional systems. Whereas CAI offers repetitious, programmed, and packaged course material, computer conferencing promotes the dynamic of human interaction. "Computer conferencing...allows for genuine communication between the instructor and the pupil. With computer conferencing, there is a constant back-and-forth dialogue with the teacher as well as other students, both online" (Cross, 1983b, p. 31). The notion of human interaction and dialogue in the learning situation is also stressed by Vallee (1982). Vallee argues that the benefits of computers in education cannot be fully realized until the social framework of learning changes, and then most likely only via a different technology, for example, that offered by computer conferencing systems.

> To make it happen, a much clearer distinction should be made between the 'affective' and the 'cognitive' content of education. American teachers often seem to equate all learning with cognitive knowledge, which indeed can be delivered by computer terminals as easily as it can be delivered by books or blackboard. What they miss consistently is the affective part of this knowledge, the emotional link to what is learned. An indispensable part of education is being chopped off in computer-education experiments. To correct this problem, we ought to combine a human conferencing system with the cold repetitive programs that deliver the basic information. When this simple step is accomplished, we may see computer-aided education flourish. (p. 32)

4.2 Adult Education and Computer Conferencing

Although little research exists in the area of computer applications for adult education, we can extrapolate from the literature available on adult learners to offer some observations on the appropriateness, applicability, and value of computer conferencing to professional development activities. One of the areas relevant to this study is research on learning media preferences.

An important feature of adult learning is that adults want to find the most efficient means of achieving their learning goals. Self-directed learning is a preferred approach (Knowles, 1975) and as a consequence, learning media preferences are affected by these features. Zemke (1981) summarizes the following curriculum design guides:

> 1. Adults prefer self-directed and self-designed learning projects, 7 to 1. The desire to control the pace, and starting or stopping times strongly affects the self-directed preference. Self-direction does not mean isolation, however. Zemke notes that studies on self-directed learning indicate that such projects involve an average of ten other people as resources, guides, or encouragers. In fact, the incompetence or inadequacy of these same people is often rated as a primary frustration.
>
> 2. Adult learners often indicate a preference for including more than one communication medium in the course design. Reading and talking to qualified peers are among the most preferred resources, but even the self-professed, self-directed learner will positively rate lectures and short seminars, if these activities provide one-to-one access to an expert.
>
> 3. Regardless of the medium of presentation, adult learners prefer a practical content orientation which includes relevant information and applications. Furthermore, this need is often a primary motivation for undertaking a learning project. (p. 47)

All of these facets of adult education can be actualized through computer conferencing applications. Computer conferencing systems can facilitate:

- Self-direction: Control over stop/start time, pace and place of the learning or communication activity are possible. Learning takes place when and where it is needed and convenient, and for as long as it is effective. Instruction is individualized in terms of the learning schedule and methodology, which allows for the opportunity to learn by insight and reflection rather than by rote. Self-direction is also possible in the selection of learning activities, since a learner may participate in a number of different conferences or learning sessions within one day.

- Access to experts and peers: Either through a forum set up for that purpose or through private electronic messaging, learners could contact respected others for help and advice.

- Access to learning and research resources: Through a central computer, learners could have access to on-line databases, information retrieval, or on-line card catalogues.

- Follow-up, feedback and implementation support from peers or experts: An on-going learning approach to enhance integration of new ideas, and of theory with practice, becomes possible with a computer learning network. Moreover, broadened communication channels can be used to encourage information or resource sharing, and cooperation among teachers.

Computer-mediated learning can enrich and enhance the learning environment for adults, but the mechanisms for its use must be carefully planned. One approach would be to establish a provincial learning network to enhance both educational and communication possibilities for professional development and adult distance education.

4.3. Strategies for Applying Computer Conferencing to Distance Education and Professional Development

Computer conferencing can be used to create a learning network to overcome some of the isolation experienced by distance learners, and also to provide an environment in which theory can be directly linked to classroom practice. For example, teachers could draw information relevant to their needs from the network, as well as using it to support the implementation of new ideas. Conferencing can also provide an alternative to classroom learning by offering a medium to enrich, supplement, and in some cases replace existing face-to-face activities. Possible applications to be included in a provincial computer learning network providing professional development and support to teachers follow. Within this list are contained suggestions specifically related to the introduction of computers in the classroom.

4.3.1 Educational Tool

Computer conferencing could be used as a tool to deliver educational resources, instructional resources, and professional support.

1. "Electronic University": An electronic university could be comprised of any or all of these components.

    a. On-line seminar: Davie (1984) hypothesizes a graduate seminar in education being offered on-line. Such a course would include instructional presentations which could be mailed or sent on-line. Students with computers and printers could thus obtain the information at home or at work. A computer conferencing system would provide a seminar-type medium for facilitating class or group discussions. In addition, student assignments could be mailed (electronically or conventionally) to the instructor, and comments entered onto the computer, either in the form of a message or into the file containing the paper.

    b. Computer tutor: University course material could be delivered through CAI programs such as those offered on PLATO. The conferencing system could supplement the course content by providing two-way tutorial support for the learners. Also, conferencing or messaging would serve as mechanisms for facilitating interaction among the learners.

2. Electronic in-service: This could supplement face-to-face activities such as professional development workshops, in which an instructor would provide theory and ask teachers to implement ideas in their classroom practice. Discussions and exchanges would not end with the workshop, but rather contact among class members as well as with the instructor would be maintained through the computer network. Feedback and peer support could encourage collaboration among teachers during the implementation phase, and group projects could also be undertaken.

3. On-line specialist forum: A time-independent private communication link between teachers and subject area specialists could be effected through electronic messaging. In this manner, feedback on specific problems could be obtained quickly and efficiently.

4. Access to course-related materials: The use of computer conferencing might include access to a full-text information retrieval system containing copies of required course readings or other articles. Any page could be amended by the instructor, or read or printed as needed by the learners. Such a facility would enable any document to be updated or revised as needed, thus providing the learner with the most up-to-date version of materials.

5. Access to learning resources: Computer conferencing could support independent research by providing:

    a. up-to-date, on-line, annotated bibliographies;

    b. a network with a reference librarian (who could receive information requests through electronic mail);

    c. the possibility of accessing large databases such as ERIC or ONTERIS;

    d. a facility for storing student papers on-line as a local information resource.

4.3.2 Communication Tool

Computer conferencing systems could be used to encourage collegial networking, professional collaboration, and exchange of information.

1. Peer support: Collegial networking via computer could provide peer support for exchange of problems, solutions, or ideas related to classroom activities and educational concerns.

2. Special interest group networks: SIG networks among such groups as primary school teachers, content area specialists (for example, math, science, literature, geography), or Board-level coordinators and consultants could exchange information related to their particular interest group. These groups would already have demonstrated a need to communicate regularly; the conferencing system could enhance that communication by handling some of the more routine problems or questions through electronic messaging, or provide a forum for on-going discussion of areas of interest through computer conferencing.

3. Professional association contacts: Communication among committee members, as well between committees and the general membership could be enhanced by electronic communication and discussions. In some cases the number of face-to-face meetings required could be reduced.

4. Supplement to professional meetings and educational activities: New professional ties could be established, as could opportunities for maintaining or enhancing contacts and collegial networks, such as those established at professional training activities, meetings, or conferences.

5. Teacher/consultant links: Communication between teachers and board consultants could be enhanced. This could assist consultants' assessment of teachers' needs, and support the resolution of problems faced by teachers in the classroom. The record-keeping facility of the conference could also be used to help consultants prepare electronic or paper-based newsletters of activities in the board.

6. Joint projects: On-line collaborative activities such as curriculum development, position papers, and other professional activities could be facilitated electronically.

7. "Hot-line": An electronic hot-line could be established through which experts could respond to immediate computer implementation problems. For example, the ICON has been introduced into many schools, but frequently, when problems arise, it is difficult to locate knowledgeable peers to provide help. If there existed an ICON users' "hot-line", an expert could be contacted even outside of regular school hours and help provided quickly. Such a service could be particularly useful in more remote areas of the province, where there may be a scarcity of local experts. Also, the record-keeping facilities of the conference could assist in the preparation of a "trouble-shooting" newsletter for teachers.

4.3.3 Classroom Resource Tools

A variety of classroom resource tools could be accessed electronically to support teachers' classroom activities. It is important that teachers be able to download any, or all, of these resources to their own microcomputer for local processing.

1. Teacher's on-line tool-kit: Teachers could access such professional resources as: a database of curriculum suggestions and experiences from other teachers; quizzes; tests; exams; or local databases. Class management instruments such as electronic agendas, programs to calculate student averages, or attendance recorders could also be made available.

2. Annotated software bank: The annotations would be entered by teachers who had tried various programs in their classrooms. Their entries could include evaluations, comments, and curriculum implementation suggestions. Such a tool would help teachers select appropriate software from the innumerable public-domain programs, as well as offering suggestions for their use.

3. On-line journals and/or electronic newsletter: Professional journals, in grade or subject specialties, could be offered in full-text form, or their abstracts could be available for on-line browsing.

4. Software exchange: Ministry of Education funded software, for the Ontario approved educational microcomputer, could be distributed electronically. Such a mechanism would reduce the need for costly and time-consuming reproduction of diskettes and would eliminate the need for sending them through the mail (with the associated possibility of loss or damage).

5. Databases: On-line access to databases containing abstracts of classroom resource kits, books, journals, special education materials, or local curriculum guidelines would provide teachers with the equivalent of an endless library shelf.

6. Electronic bulletin boards: This software tool could provide the means for informing teachers about local board activities, workshops, interesting speakers in other locations, or classroom tips. Since the nature of bulletin board communication is informal, quick-paced exchanges of information relating to current events would be facilitated.

4.3.4 Planning and Evaluation Tool

As well as being a valuable tool to enhance communication, increase educational opportunity, and provide access to a wider variety of information resources, computer conferencing and networks could assist in the planning and evaluation processes of a variety of organizations.

1. Program planning by providers of professional development: Activity plans could be distributed to members of planning committees much more quickly and efficiently than through the mail. Also, some planning work could be accomplished electronically before committees meet to discuss issues, thus making their face-to-face meetings more profitable.
2. Logistics of meetings: The logistics of meeting times and/or location could be decided electronically, thus eliminating the need for extensive telephoning and reducing "telephone tag". Meeting times could be posted and the agenda could be publicized in advance of the meeting or activity.
3. Advance member polling: In order to maximize the value of meeting times, member opinions could be polled before a meeting or activity. In this manner, much of the meeting's introductory material could be dealt with before the face-to-face meeting begins.
4. Input from absent members: Many organizations meet at regular times each month with meeting dates set far in advance. Inevitably, there are members who cannot attend particular meetings, but if agenda items have been posted electronically in advance and member opinions polled, valuable input from people unable to attend could be collected and reported at the meeting.
5. Enhancement of workshops/seminars: In order to improve participation of attendees and the depth of discussion possible at a workshop, meeting, conference or seminar, issues or papers could be publicized electronically prior to their presentation. People could read the position or discussion papers at their leisure, and have time for reflection. This would be a particularly useful capability when handling complex issues or problems.
6. Member voting: Frequently, participation in voting or decision-making processes is low due to a variety of reasons. Usually in order to vote or participate, committee members must be in attendance at a meeting, but by using the on-line voting facility available on most computer conferencing systems, people unable to attend face-to-face meetings could still participate in the collective process.
7. Evaluation of meetings: By using the on-line voting facility, or alternatively, a discussion or questionnaire format in the conferencing system, members could evaluate meetings or activities, but perhaps more importantly, share their evaluations more easily. The evaluation process could benefit from peer interaction and feedback.

While computer conferencing systems offer many advantages as noted above, it is important to recognize the existence of a number of pitfalls and deterrents, and consider them carefully when designing computer conferencing applications for education.

4.4 Pitfalls and Deterrents to Electronic Learning

Computer conferencing is a new "medium", and involves interacting in a new "space". In order to learn how to move through this "electronic space", the user will require new skills, attitudes, and behaviours (etiquette). Print-based communication is taken for granted in our society, although members of non-print societies experience great difficulty in learning to attune the eye to discern individual characters and synthesize these to recognize words, phrases, and eventually, ideas. New attitudes toward communication must be learned; new methods for expressing ideas are embodied in the medium; and new psycho-motor skills are requisite for the tasks of reading and writing.

Less than a hundred years ago, the introduction of the telegraph and the telephone necessitated significant learning on the part of users. While today, talking on the telephone is taken for granted, it caused great discomfort and resistance on the part of new users when it was a new communications medium. In an article published around 1900, Angus Hubbard, General Manager of the Chicago Telephone Company, observed that "the man who knows how to use the telephone properly is a relatively rare personage" (Vallee, 1982, p. 40). The article goes on to provide technical pointers, such as where the lips should be located in relation to the receiver and how to speak into the telephone, but notes that the crux of the difficulty with electronic communication lies in a lack of mental focus. The early user resisted the new communication because of difficulties in realizing that "he is not speaking into a hole in the end of an iron arm, but speaking into the ear of a man (p. 41)".

Lack of mental focus remains a key problem in electronic communication even today. There is a need for guidelines, or protocol, to orient new behaviours appropriate to the new medium. Participants introduced to computer conferencing can experience a sense of disorientation when first working in "electronic space", for they are not familiar with the "cue loads" of electronic communication. Cue loads include such behaviours as smiling, voice intonation, handshakes, nodding, and other nonverbal cues (Sevel, 1984). The discomfort is heightened in group or public communication. This is evident in the case of tele-conferencing where participants, who are already familiar with telephone communication, must learn how to behave when engaged in group telephone activities (Burge, Roberts, and Waldron, 1984). Computer conferencing is similar; it is a form of publishing. What each participant writes usually remains as a permanent record or "proceedings" to be read by all other participants on the system. Participants in computer conferencing can indicate a reluctance or inhibition in using the new medium because of a fear of looking foolish in front of others, compounded by the unfamiliarity of the new terrain. Participants with poor typing, spelling, or grammatical skills also feel reluctance.

The electronic medium involves new sets of social relations, or at least tends to blur some of the status "cues" traditionally recognized in most other communication forms. Computer conferencing systems have been lauded as offering a more egalitarian form of communication exchange, due to their anonymity. Traditional symbols such as sex, race, class, physical attributes, or handicaps are not visible, and thus not at play in electronic communications. While this can be seen as advantageous in many circumstances, there are also situations in which the loss of such "cues" or symbols can be threatening, particularly to those in positions of power and authority. Another possible deterrent to the use of conferencing systems is that people in positions of power may avoid using the computer because they perceive that typing or keyboarding is low-level secretarial work.

System software (both at the operating level and the conferencing system itself) can inhibit use. Software must be user-friendly, non-threatening, and easily accessible, or the user will become intimidated and stop using the system. The thick operating manuals which accompany many computer communications systems often serve less to "help" than to overwhelm the user.

It is important to remember that the social situation of electronic classrooms is vastly different from that of traditional classrooms because of present limitations of technology. For example, like telephones, computer conferencing transcends distance, but unlike telephones, computer conferences do not permit audio communication. With both visual and audio cues eliminated, conference participants are restricted to the written word. It is interesting to speculate at what point in time computer systems, able to support the mixture of digitized speech and typed text, will be commonly available and further, what we could do differently if we had such capabilities.

Cost may act as a deterrent. Computer conferencing usually involves a number of computer-related costs, in addition to any long distance or network charges. The awareness of a "ticking meter" may negatively affect the quantity and quality of participation.

Some people believe that advances in speech synthesis and recognition will eliminate the need for typing skills, and possibly within the next fifteen to twenty years this will be the case. However, the fact remains that typing ability is needed now, and will be needed for some time to come. Tracz (1980) stated that

> the skill that I found most critical for effective utilization of a computerized conferencing system was a greater than average typing capability. Not being a fast typist, I began to suffer from "terminal anxiety" brought about by wasting valuable on-line terminal time looking for the "Q" key. (p. 15)

At the present time, one of the most complicated procedures involved in using a computer conference is accessing it through a packet-switched network. Participants must be familiar with the precise access protocols not only for the network, but also for the host computer. If a person were participating in distance education courses offered on several different computers, then the problem would be magnified. As in business, where a caller's first impressions can be influenced by the telephone manner of the receptionist, new users of computer conferences can have their opinions adversely effected by frustrating, initial access attempts.

4.5 Summary

It is clear that in spite of the pitfalls and deterrents to electronic learning, there are a plethora of possible ways in which computer conferencing systems and network communication could enhance traditional education. However, it is not enough to simply imagine applications, since the implementation of any change requires careful development of strategies to ensure the successful integration of new ideas, or methods of working into existing practice.

Moreover, implementation guidelines or strategies must remain flexible, in order to accommodate formative feedback from research and project trials. Within this context, then, guidelines for using computer conferencing and networks have been developed and are explored in chapter 5.

Chapter 5

5. IMPLEMENTATION GUIDELINES FOR COMPUTER CONFERENCING

5.1 Overview

This chapter will describe in detail implementation guidelines for integrating computer conferencing into distance education and professional development. Included will be background discussions of social psychological features, and software and hardware considerations, followed by specific implementation suggestions.

5.2 Social Psychological Features

Research into computer conferencing systems points to the influence of both social and psychological factors on users' acceptance, and integration of the new medium into their professional life. As stated previously, the EIES study found that the strongest predictors of use are attitudinal and motivational variables, rather than any "objective" characteristics of the users, such as previous computer experience or typing ability (Hiltz, 1984), although other sources have placed more importance on the role of typing (Tracz, 1980). The significant variables in the EIES study included expectations about system utility, and the number of personal acquaintances who were expected to be on-line. Analyses of conferencing system use indicate that social connectivity issues play a central role in the process and outcome of system usage and acceptance. The strongest predictor of subjective satisfaction is the extent to which the system has expanded social networks by facilitating meeting and working with new colleagues who share similar interests.

The lack of non-verbal communication cues in computer conferencing suggests a need for new communication skills. While Hiltz (1977) has stated that the lack of non-verbal cues in written communication could be beneficial, since they can distract from the cognitive content of a person's message, it could also be argued that a great deal of non-cognitive, but information-rich communication is contained within such cues. Their elimination from communication should be considered a loss. There is a need to investigate and develop computer conferencing etiquette as part of distance education courses. For example, how does one tactfully indicate to a student that a three or four page "comment" is too long, or that two people dominating a conference discussion need to consider other students who may be intimidated by their verbosity. Also, it has been found that people will frequently use much stronger language in computer-based communication than they would normally employ in either written correspondence or telephone conversations (Kiesler, Siegel and McGuire, 1984).

The users' group has been found to affect individual perceptions of the value of the system. The importance of effective leadership, group process, as well as the nature of the task on which the group is working have been identified as key factors in the dynamics of conferencing (Hiltz, 1984; Brochet, 1985; Ellis and McCreary, 1985; Swart, 1985; Thorngate, 1985; Tombaugh, 1985). Less well-structured or managed conferences often flounder and die. As in the management of face-to-face group communications, managing computer-mediated communications involves complex process skills.

In our interviews with educators, a frequently expressed response to the question of how to motivate students was to ensure that they receive ample, useful information each time they access the conference. This means that the role of the conference moderator assumes more importance than one might expect to find in a traditional course. Unlike traditional seminar courses in which the instructor can assume a secondary role, thereby allowing students to determine the flow of discussions, a computer conference needs careful direction by the moderator. In face-to-face meetings, the exchange of ideas is spontaneous and rapid; however, in a computer conference, a participant may spend only one or two hours per week reading and responding to conference items. It is the slowness of this communication medium that forces the moderator to impose a careful organization on discussions, and ensure that each time participants access the conference, they find some new and valuable information.

5.3 Software and Hardware Considerations

One of the most important features of any conferencing system must be its ability to adapt to the changing needs of users, as they become more sophisticated. The EIES system has attempted to address this problem through the implementation of multiple command languages. Four different levels of the language permit the user to:

- select a numbered option from a full menu listing;
- select an option from an abbreviated menu (a statement reminding the user of the larger menu would be displayed but not the full menu);
- define commands comprised of nouns and verbs;
- define, store, and invoke command procedures.

- define commands comprised of nouns and verbs;
- define, store and invoke command procedures.

While the EIES language implementation is a step in the right direction, it still requires the user to be familiar with a large number of commands, or to work with an accompanying system reference card (Strom, 1982).

Franz and Robey (1984) describe a promising approach to user-led system design. While their study refers to the design of an insurance company's management information system, their method of applying ethnographic research techniques to problems of collecting data, over a two-year period, is interesting for designers of conferencing systems. They attempted to capture, using formative evaluation feedback cycles, subjective opinions of the end-users of the system during the design phase, and channel these suggestions into system modifications.

As well as issues of system design, software considerations include the necessity of users being able to take advantage of their personal computer's capabilities for local filing and editing. Thus, learners could capture information of most interest from a central source, edit or rearrange concepts if desired, and build their own personal depositories of information. Sophisticated file transfer programs, such as KERMIT (Da Cruz & Catchings, 1984a; 1984b) could be used to facilitate the up and downloading processes, thus ensuring file integrity. Also, to help with the "log in" process, some communication packages, such as Busyterm or Crosstalk, are available for microcomputers. These packages will not only store the necessary telephone sequences to access remote computers, but will also log the user onto the host computer.

On the main conferencing system an important feature would be the ability for participants to insert comments into the text. For example, if a student was assigned a reading and asked to write a short précis, other students could have the opportunity to insert their comments within subsections of that text, rather than simply adding successor comments. This implies a difficult implementation problem, since the original text itself would be changed. In addition, Strom (1982) has described the usefulness of inter-item editing capabilities within a conferencing system. Most existing systems permit users to edit single conference items, but the ability to split one item into several, or to combine several items into one would be a powerful feature.

Another important aspect of conferencing systems is the ability for a participant to follow the "thread" of a conversation easily. This is usually handled now through the use of tree walks; however, Strom (1982) has pointed out that "there is a problem with forward and back references" (p. 311). Also, as the interconnection structure between conference items becomes more complex, the difficulty of locating related items increases. Strom (1982) has suggested that the use of linked key words would be helpful, but the computer must then maintain large indices. However, when one considers the possibility of using conferencing systems in education, where at least one of the aims of learning is to be able to establish relationships between ideas, the ability to navigate easily through complex data structures becomes critical.

Such features as a spelling checker or on-line thesaurus would also be extremely valuable software tools as participants could send messages largely free of typographical errors. These features could help to overcome some of the reluctance many adults experience using computer conferencing systems. Additional hardware and software characteristics might include the ability to backscroll across previous screen "pages", so that users feel less anxiety if the text scrolls quickly from view.

Data storage and transmission are also features of general system design which need to be considered. For example, in Canada about two-thirds of all households are linked to coaxial cable systems which are, at present, being used almost exclusively to deliver television images. In this role they are being underutilized.

Some say the transfer of nonvideo information by cable will be the "new revolution" in home communications. This year, for example, two Ottawa cable systems became commercial distributors of software, using technology pioneered by the financially ailing Nabu Network Corp. One day, this technique will enable any cabled home to rent sophisticated programs for university courses, word processing, spread sheets, and so forth for a few dollars a month. The technology permits a subscriber to access large databases without a two-way, interactive link (such as a phone link) to ask for the segments of a database wanted. You need only the standard, one-way cable that brings TV into the home. (The Financial Post Report on the Nation, December 1984, p. 68)

Problems normally associated with the storage of large databases could be overcome by using videodisks which would contain, for example, thousands of different articles, books, or other data sources, including photographs or drawings. Furthermore, extremely rapid data transmission could be accomplished by using satellite signals.

5.4 Guidelines for Implementing Conferencing Systems

5.4.1 Informed Self-Screening

Those with poor initial expectations of the system, of the importance of the task, or of communicating with others on the system, are unlikely to sign on or maintain sufficient motivation to "graduate" through the learning process. Several suggestions for self-screening could prove helpful to those people anticipating putting a group on-line.

- Provide an accurate description of the system, the task, requisite skills and knowledge, an appraisal of the time and effort required, and some of the expected benefits. This could be achieved through mailings, or face-to-face activities such as meetings or interviews.

- On the basis of the information provided, allow for self-screening among the prospective participants.

5.4.2 First Experience

A successful first experience using the conferencing system is vital to a user's perception, and perhaps eventual acceptance of the medium. First-time users need to be reassured that the system really works, and that they can learn the necessary skills to operate effectively electronically. Some suggestions to help users overcome anxieties when they begin to use computer conferencing include the following:

- When an account is established, a greeting should be sent from the conference moderator or support personnel. The greeting should also invite a return message from the new user.

- The new user's first response indicates that some minimal learning has occurred, while the message content may indicate the user's feelings, fears, or concerns. Such information should be noted and extra support provided if needed.

5.4.3 Introductory Tutorials

A number of studies of computer conferencing implementations have suggested that a well-organized introductory tutorial is valuable (Brochet, 1985; Tombaugh, 1985). An initial group, face-to-face meeting is valuable for building group cohesiveness, conference etiquette, computer literacy skills, and commitment. Also, organizers can provide information on a one-time basis to everyone rather than repeating the same material with each individual. Even though there are expenses to be considered with this option, the gains could be significant. No longer would students be communicating with "faceless" entities, but with known personalities. For example, computer conferencing systems could be used to follow-up face-to-face training, professional development activities, and to encourage communication.

To achieve high acceptance and participation rates, up to 24 hours of training and encouragement are required per person (Hiltz, 1984). Suggestions for structuring initial tutorials include the following:

- Include hands-on activities;
- Provide a demonstration or model lesson hand-out. According to Brochet (1985) "the effort required to develop an easy-to-use "sample lesson" handout would be regained in terms of less anxiety for novice users, and less chance that the professional user would reject this communications medium" (p. 81);
- Provide accurate system documentation manuals. Each participant should receive a printed set of clear, explicit instructions on how to access the system and its various features. The documentation should "illustrate the use of the protocol by showing actual dialogue sequences that achieve specific objectives" (Gaines & Shaw, 1984a, p. 345). Moreover, since people tend not to read long explanations, it is particularly important that there be no superfluous dialogue and no errors.

5.4.4 Access to Personal Computers

Providing access to personal computers is a critical concern. There is a distinct difference, both in participation levels and attitudes, between those members with proximal access to computers (in the home, school, or office), and those who have to travel any distance to sign on (Brochet, 1985). If one is looking for a uniform level of acceptance, it is essential that a uniform level of access be provided to participants. Moreover, conference organizers must ensure that teachers participating in computer-mediated professional development activities have access to a computer, not only during the period of the activity but also for follow-up. Teachers participating in computer training activities should be assured access to a computer in the classroom, in order to have an opportunity to implement what they have learned. Waldron (personal communication, January 1985) suggests purchasing inexpensive microcomputers, and having these available (on a loan basis) to any student taking a course in which electronic communications are included.

5.4.5 Role of the Moderator

Ensuring that students have access to useful information is an important prerequisite to distance education incorporating a computer conference, but the organization of that information is even more crucial. For example, as with face-to-face communication, electronic discussions can become tangential to the original theme. In such cases, the facility to split ideas into new conference discussions becomes important for the moderator. This feature will allow interested participants to pursue new ideas, while the original discussion theme can be followed by other students. Moreover, imposing limits on the length of responses, as is often done in traditional courses, may be required. The etiquette of electronic communication is still nebulous, and much research needs to be undertaken.

Assuming that the moderator makes available useful information to participants on a continuing basis, one is still faced with the problem of how to overcome initial student resistance to adopting new communication techniques. One method of encouraging participation in a distance education computer conference is simply to make it a requirement of the course (force people or offer special professional recognition). The instructor can stipulate, for example, that in order to obtain credit each student must access the conference at least some arbitrary number of times, and must make substantive comments on each occasion.

Leadership or moderator activities can be divided into distinct roles. For example,

1. A process leader would be responsible for conference management activities, such as summarizing the group's progress in order to focus the discussion, and obtaining feedback from the members about the group procedures.
2. A content leader would be a subject-matter expert.
3. An administrative support role would include admitting and orienting new members.

Although there is no precise list of responsibilities for a conference leader or moderator, the following provides some guidance. The moderator needs to:

- encourage full participation by all conferees;
- urge accurate structuring of messages;
- promote a mutually supportive climate within the conference;
- focus attention on significant ideas generated in the conference in order to obtain a thorough discussion of them.

In order for moderators or leaders to effect these roles, a conference must include one or more people who will assume an active leadership role. These people can take responsibility for such components as process management, and content and administrative support. To be effective, leaders should expect to spend an hour or more on-line, every day, organizing and stimulating discussions and coordinating tasks (Hiltz, 1984). Further, leaders must provide support for the users as they are learning to use the system. Arrangement of release time from other responsibilities, and the use of clerical assistants would be helpful for those conferences requiring strong leadership. Thorngate (1985) suggests that since skilled leaders need not be academics or effective participants, a case could be made for hiring conference leaders or administrative assistants.

Ellis and McCreary (1985) provide the following suggestions for moderators:

- Keep directive statements sparse and light-handed.

- Monitor conferee behaviour through total number of messages and most recent sign-ons.

- Pose problems to be solved, or questions that prompt divergent responses. This technique can lead to more complex discussions rather than to yes-no dichotomous answers.

- Model peer behaviour, by disclosing some personal characteristic such as experience, conviction, insecurity or curiosity.

Social psychology research indicates that the effectiveness of any given leadership style varies with the nature of group members and the task (Thorngate, 1985). Thus, it is unlikely that any single leadership style will be universally effective for computer conferencing. In order to address this problem, the conference moderator should discuss with the group what role would be most appropriate for the aims of the particular conference. Tombaugh (1985) suggests that the role of a moderator be clarified at the beginning of a conference. For example, powers to be considered could include the moving of conference items (in the case where topics are separated) to a more appropriate topic area, or the deleting of repetitious or inappropriate items.

5.4.6 Establishing Ground Rules

There is a need to establish ground rules for a conference, and one suggestion is to include collective group discussions of issues. This is particularly important in situations where the members are using the conferencing system for the first time. Group discussion could orient new users to the medium, by focusing their communication and encouraging active participation. Also, the system voting facility could be used for reaching consensus on the role of participants in a conference. The very idea of guidelines might even be rejected by the group. Some possible issues for discussion include:

- Are guidelines for conference group dynamics necessary? How should they be developed?
- What should be the moderator's responsibilities and powers? What style of leadership is appropriate and desirable?
- How should the group handle "process problems"? For example, a common problem in computer conferencing system communication is that of the "dominant personality". Its effect on the group, and how to deal with it, should be discussed early in the conference while the communication patterns are still flexible, and members are not defensive about their communication styles.
- What (if any) limits or guidelines should be set regarding message length?
- What types of comments are appropriate and which are not?

5.4.7 Climate Building

Climate building refers to the active attempt to create a group or community feeling in order to facilitate communication processes. This has been found to have particular value in a depersonalized medium such as computer conferencing. As mentioned earlier, the absence of non-verbal feedback mechanisms such as facial expressions, gestures, body language, tends to intimidate new users. Positive climate building can reduce anxiety about the system, and encourage active participation among members by increasing affectivity within the medium. To be effective, however, climate building should be viewed as the responsibility of both the moderator and participants. Once could encourage climate building by encouraging recognition activities such as:

- use of first names among the members;
- use of reinforcement phrases ("very good"; "all right");
- use of welcoming phrases ("great to see you aboard!").

Displaying self-depreciating humour, employing personalizing remarks, or providing assistance and support to members could also be effective.

5.4.8 Providing Models

One of the major difficulties in implementing computer conferences has been how to provide organization and focus to a conference. Thorngate (1985) argues that for computer conferencing to achieve its potential in generating high quality material and communication, norms must be established. He offers two possibilities, and suggests that the second is more effective.

1. Construct and publicize an appropriate set of rules of order for computer conferencing.

2. Generate and publicize some examples of high quality computer conferences.

User manuals could contain excerpts from good conferences to provide models for new participants, and suggest (concretely) the quality and level of participation they should expect from others and themselves.

5.4.9 File Transfer and Local Processing

It has been found, in studies of computer use, that if people are required to learn commands for several different computer systems, it is most unlikely that they will do so (Reisner, 1981). Moreover, existing mechanisms for data manipulation, and transfer from one computer to another, are frequently complex and difficult (Tombaugh, personal communication, February 1985). In Ontario, where there is a standard approved educational microcomputer (ICON), it is feasible that such problems can be addressed and solved more easily. Some suggestions include the following.

- The capabilities of the Educational Computing Network of Ontario (ECNO) should be exploited. ECNO is based on the network features of DecNet (Digital Equipment of Canada's network architecture developed to run on VAX computers) and is extremely reliable. Unlike many network systems where information can be sent to remote sites, and the sender receives no indication as to whether or not their messages have even left the local site, DecNet provides reliable links between computer nodes.

- Standardize on one microcomputer and develop file transfer mechanisms for it. In Ontario the ICON should be selected, and file manipulation procedures standardized so that ICON users can take advantage of ECNO's capabilities.

- Provide extensive training on how to use local word processing, and file management and transfer facilities. Documentation on how to accomplish file transfer tasks, access ECNO, and find information must be developed and distributed. In addition, relevant on-line documentation should be easily accessible through ECNO.

- The development of local user directories is critical. Imagine that a person needed to telephone someone, did not know their number, and had no access to that information; the call would be impossible to place. Likewise, if people are expected to communicate electronically, and no mechanism is in place through which they can easily locate user names and "computer addresses" of colleagues, little sharing of information is likely to occur. There could also be a personal profile directory in which participants, on a volunteer basis, could describe their subject-area specialties, special interests, and provide addresses and telephone numbers. Furthermore, names and locations of ECNO nodes should be available on-line, including contact people at each site.

- On-line indexes of resources available at the local ECNO node and at remote nodes on the network are critical. In this manner, resources and materials can be shared equally so that smaller or poorer boards, with less access to information are not penalized.

5.5 Summary

Although many of the guidelines and suggestions presented here are concerned with social psychological factors, this is not to imply that hardware and software issues are not of equal concern. Simply, human responses to the use of new technology are harder to predict, and very little information exists in this area. What is interesting is that during the course of this project, two workshops in computer communications were attended (one sponsored by the University of Waterloo/University of Toronto Cooperative on Information Technology and one at the University of Guelph). At both conferences it was noteworthy that hardware and software developers met in separate locations from those people discussing applications or social concerns; there was also little interaction between the groups. Rather than asserting in this report the relative merits of hardware, software, or social psychological features of computer conferencing, it is the belief of the authors that a healthier approach to solving problems of technological change is for developers and users to be meeting, discussing ideas, and acting together. It is this interaction which can provide formative evaluative feedback to implementation strategies.

Chapter 6

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The purpose of this study was to synthesize existing knowledge and experience about computer conferencing and networks, and to consider their potential as educational support tools for teachers in Ontario. The study began by situating the teacher/trainer in Ontario within a context of change, as a result of the introduction of computers into schools. As was noted in the report, traditional strategies such as professional development courses and distance education have certain limitations in addressing the new professional needs. Computer networks and conferencing systems were found to be an attractive alternative, or supplement, to existing activities. They represent potentially cost effective strategies for maximizing scarce resources such as training personnel and materials, and offer a mechanism for democratizing access to quality professional development for Ontario teachers regardless of their location. Moreover, they are an appropriate medium for delivering adult education by facilitating self-directed learning, individualized instruction, and cooperative learning. An added dimension is that electronic communication can support the development of a learning society and lifelong learning, by establishing links between the home, the workplace, the community, and educational institutions. Strategies for using computer conferencing as educational tools, communication tools, classroom resource tools, and planning and evaluation tools were proposed, and guidelines for implementing conferences were outlined.

On the basis of these research findings, we conclude:

1. Computer conferencing has major potential for the delivery of distance education and professional development to teachers in Ontario.

2. Computer conferencing represents a powerful medium to support collegial interaction, and the change process associated with the introduction of computers into the classroom.

3. There is a need for such activities in the field.

4. It is feasible to implement a computer learning network in Ontario.

However, knowledge about facilitation of on-line conferencing is only beginning to be accumulated, and the area of electronic learning is at an even more initial stage of understanding. Therefore, as a major component of our conclusions, we have identified several key research questions for follow-up study.

1. What is involved in setting up a computer learning network for teachers in Ontario? For example, what are the logistics of using ECNO for educational applications?

   What conferencing system software would be most appropriate (currently there are over thirty systems available in North America)?

   What type of training is most appropriate for professional development instructors and learners (appropriate mix of face-to-face, on-line, hard-copy documentation)?

   Which user support mechanisms are most helpful or appropriate for the adult learner (help mechanisms, user consultants, documentation)?

2. Which instructional design issues must be considered when developing computer-mediated courses? For example, which courses and content are most appropriate to be delivered on-line?

   Which course components are best computerized, and which are best delivered by other methods?

   Which instructional methods or styles are most appropriate for computer-mediated learning?

3. How does user behaviour evolve in relation to computer conferencing, and what is the effect on course design? For example, what is involved in learning to use the computer in an educational context?

   How do learners react to different features of the system (menus, commands) at different points in their experience?

   Which features of the electronic medium (ie. conferences, electronic messaging, text editing, databases) have been accessed most often? Least often? Why?

4. How effective is computer conferencing as a learning tool? For example, which factors should be taken into account when measuring the effectiveness of electronic learning? (These could include learner satisfaction, dropout rates, participation rates, or learner achievement).

   How does electronic learning compare with other forms of adult education such as distance education and classroom courses?

   How effective is computer conferencing at overcoming learner isolation?

5. What is involved in managing the electronic learning environment? For example, how to structure electronic class interaction? (This could include such issues as group dynamics, role of the instructor, or keeping track of discussion themes.)

How to motivate the learner to sign on and maintain participation?

How does the electronic medium affect the amount of time an instructor must devote to a course?

6. Which learning resources should be available on-line, how should they be structured so as to be easily accessed, manipulated, and used? For example, what data standards need to be established?

   Which user interface design is most appropriate for users at different levels of expertise?

What are the essential access mechanisms and file transfer tools for maximizing use of network resources?

7. What has been the impact of the computer learning network on the educational community? Has it promoted collegial interaction and support?

   Has it broadened professional contacts?

   Has it supported the teachers in implementing computers into their curriculum? if so, how?

Information about these issues is critical to advancing existing knowledge of educational applications of computer conferencing. However, they can only be answered through the actual experience obtained from designing, implementing, and evaluating activities in practice.

Certain conditions already exist which are favourable for implementing research and development projects to address such questions. These conditions include:

- the existence of considerable development activity for the Ontario approved educational microcomputer (ICON).
- the existence in Ontario of professional association groups who are already actively involved in networking, and in supporting the introduction of computers into the classroom;
- the planned development and delivery of university-level, computer-mediated, distance education courses for educators.
- the existence at OISE, and the University of Guelph, of computer conferencing systems;
- the existence at OISE of a VAX link into ECNO;

6.2 Recommendations

On the basis of our research, we recommend the following:

1. Establish a provincial Computer Learning Network in Ontario. Preliminary steps in this process would emphasize setting up pilot projects and research studies, to provide mechanisms for answering such questions as are outlined in the conclusions. These projects should also respond to current professional needs of teachers and trainers in the province. Strategies for these projects are outlined in subsequent recommendations.

2. Establish a pilot project to link ICON users in Ontario. The major focus of this project would be to provide teacher training and support mechanisms, and to study the use of computer conferencing as educational and communication tools. The project should be established within one region or school board where a supply of ICON already exists. Project-related costs would include the purchase of modems, payment of datapac and computer charges, and personnel salaries.

3. Establish a pilot project to link members of professional groups who have a clearly stated, self-identified need to communicate and participate in professional training related to computers in the classroom. The main purpose of this project would be to examine the use of computer conferencing as educational or planning and evaluation tools. As with the the pilot project to link ICON users, project-related costs would include the purchase of modems, payment of datapac and computer charges, and personnel salaries. Any of the following groups might be appropriate for participation in such a project;

   - Members of the Federation of Women Teachers' Associations of Ontario (FWTAO) course who are being trained as trainers in the area of Computers in the Curriculum;

   - Subject-area teachers' associations (for example, Science, Geography, or English);

   - Board-level computer coordinators and consultants.

4. Conduct research into the applications of computer conferencing as an instructional medium within the context of an "Electronic University." At least two universities in Ontario (University of Guelph and the University of Ottawa) are designing educational courses to be delivered by using a computer conferencing system.

5. Conduct research into the development of educational resource support materials and tools. This research should include a needs assessment to identify which learning, classroom, or teacher resources are needed by professional development instructors and by teachers. Where necessary, the appropriate software, programs, and utilities should be developed.

6. Exploit the capabilities of ECNO for housing the Computer Learning Network. Research should be conducted into the logistics involved in using ECNO for this purpose, such as developing policies and mechanisms for teachers or trainers to access ECNO nodes, up and downloading of educational resources, and establishing standards for storage and retrieval of data. This would involve standardizing on one microcomputer and developing file transfer mechanisms to facilitate the straightforward transfer of such files from a VAX node to the user's own microcomputer. In Ontario the standard should be the ICON or any OAEM microcomputer.

7. Locate the Computer Learning Network on one ECNO node, but have it accessible from any other node. OISE should be considered as an appropriate location for the Learning Network, where the recommended research and development activities could be undertaken and supported.

Appendix A

DESCRIPTIONS OF COMPUTER CONFERENCING SYSTEMS

A.1 CONFER at the University of Alberta

Background

CONFER, a computer conference and message system, was first developed at Wayne State University in 1978. It originated as an attempt to create a computer-based discussion system, and was designed as a multiple choice, ranking system able to tally responses (participants could "vote" on or "rank" an issue under discussion). CONFER was later developed into a fuller conferencing system. The University of Alberta acquired CONFER early in 1980.

Technical Specifications

CONFER is written in the FORTRAN 4 programming language, and runs on the Michigan Terminal System (MTS) operating system on an Amdahl 58/60. The MTS operating system is "home grown", and is used in only eight universities around the world (the MTS Consortium is composed of the University of Michigan, Wayne State University, Simon Fraser University, the University of British Columbia, the University of Alberta, Ryerson Polytechnic Institute, the University of Newcastle and Durham University). The use of the CONFER system is free to University of Alberta users on the MTS operating system for noncommercial uses (university research by undergraduates, graduates, faculty, etc.; administration; SIGs; mailing lists for university clubs). Commercial users include the Alberta Government and the Wildlife Services of the federal government, and are charged a copyright fee or surcharge over and above the typical MTS charges (CPU and disk charges) paid by all users. The cost structure for use of the MTS differs between university and business users. The only criterion for allowing commercial users onto CONFER is that similar commercial usage not be found elsewhere, so that CONFER is not in competition with private industry in Edmonton.

System Characteristics

The CONFER system is used for a variety of purposes, excluding such applications as accounting and general ledger packages. CONFER provides three basic types of communication, generally corresponding to a bulletin board, mail and group discussion.

- CONFER Bulletins and Announcement Facility: The bulletin board functions as a form of public mail or announcement service. Information is passed in only one direction, from the source to the receiver. Unlike other types of communication in CONFER, the receiver is not given the opportunity to respond directly to the bulletin. If however, the bulletin calls for some response, users can respond indirectly using CONFER's message facility.

- Message System: CONFER's message facility is the second level of communication. It includes the option of sending electronic mail to an individual and/or defined groups. After a message is typed, the user is asked the name of the recipient. If the user indicates that it is "O.K." to send the message, it is automatically sent to the person specified. The same message can then be sent to another recipient or the message may be 'filed'. Upon entering into the conference, participants are informed of waiting messages. Recipients of messages are asked if they wish to respond. If so, they enter a reply which is sent back to the sender, along with the original message. The message and reply can then be sent or forwarded to another person, or be filed. The facility thus has such features as forwarding of messages, sending "carbon copies", and automatic verification of receipt of message.

- Conferences: Conferences are CONFER's highest form of communication and the facility from which it derives its name. Conferencing is multi-person communication about a specific topic. This is accomplished through the use of items (subjects) entered by one participant. Other participants can then display the item and are given the opportunity to enter a "response" (or "vote"), which is appended to the item. Items and their associated comments are accessible to everyone in the conference, unlike messages, which can only be seen by the individuals named as recipients. The effect of this facility is to allow discussion similar to that which might follow the presentation of a paper at a convention or conference, except that participants need not be assembled in one place. CONFER allows for private, public and group conferences.

In the messaging or electronic mail system, messages are sent to an individual or group specified as the recipient(s). Recipients are given the option to respond to, delete, ignore (wait till later) or forward messages. When a response is sent, the initial message is included, thus maintaining a "history" of the communication. Portions of the history may be eliminated to keep messages at a reasonable length. CONFER also provides automatic confirmation of messages, and archiving (filing) of messages by both sender and recipient. Whereas mail messages are viewed only by the specified recipients, bulletin boards are viewed by all conference participants. In CONFER, dated bulletins are automatically displayed to the user upon entering a specific computer conference. Bulletins are automatically displayed only once, but may be retrieved at any time during their effective period.

The most advanced type of communication provided by CONFER is the conferencing feature. Users of the conference can author items, "messages" or short "papers", which can be viewed by all conference participants. After viewing an item users are given the opportunity to respond. Different types of responses are available. The most common are numeric responses which are used for voting (0 for no and 1 for yes), and "discussion" responses for commenting on the content of the item. In the case of discussion responses the user can enter multiple responses successively or at different times. The item and all associated votes can then be viewed by others who may also respond. Users of the system are automatically informed about the existence of new items and new votes, so that they are able to to keep up with new information or an on-going discussion. Items can be categorized into either a private agenda (a table of contents or index) by the user, or into a public agenda by the conference organizer. The use of an agenda facilitates the retrieval and selective viewing of information.

Of the approximately 10,000 users of MTS at the University of Alberta, about 2,000 use the CONFER system. CONFER is accessed an average of 94 times/day, primarily for conferencing purposes but also for messaging (although most messaging is done through the operating system). Over the past four years, conferencing has been accessed 110,000 times (an average of 27,500 times per year). In comparison, there has been 310,000 uses of messaging over the past three years (averaging 103,300/year), and SPIRES, a database that is not part of CONFER, has been used 620,000 times in the past three years, approximately 527 times per day, or 206,700 times/year.

Documentation and HELP Facilities

CONFER employs a system command user interface based on a "what-next" approach (the user types a '?' to obtain a response). On-line help facilities available are the system advisor (a private message can be sent) and help menus. Off-line facilities include the advisor phone number and/or contacting the advisor or system manger directly (office hours), and documentation such as user manuals. Although the computer conferencing system was intended to be self-help style, it was found that users preferred to have printed documentation to assist them when learning the system.

User Reactions

The University of Alberta CONFER system does not employ any formal mechanism for evaluating user reactions with regard to the software or the conference activity itself. However, the user does have the option of sending messages to the system advisor, calling the advisor directly, or sending suggestions to a conference entitled: *SUGGEST. System personnel noted, however, that in general the response is very small and there are very few suggestions. In one year, only five suggestions were entered in relation to the messaging facility, seven on the subject of conferencing, and six on the data base. Nevertheless, the system has been shaped somewhat by feedback from users. For example, the HELP mechanism was a product of user reactions, as initially the system had no help mechanisms at all. Generally, however, user reactions are not monitored, user response is not specifically encouraged, and little is generated.

Educational Applications

There are currently no educational applications of the conferencing system. There are some educational groups using the conferencing system to discuss issues such as using computers in education, but at the time of this writing no consideration had been given to the potential of CONFER as a mechanism for delivering or facilitating educational activity.

A.2 COSY at the University of Guelph

Background

The initial interest by the University of Guelph in obtaining a computer conferencing system was to enhance communication between academics on-campus. The University of Guelph already had a well-developed electronic mail system in operation for several years, and it had received heavy use. A computer conferencing system was viewed as a medium which would complement the electronic mail system and provide an improved means to facilitate campus-level academic communication. A team from the Institute of Computer Science, University of Guelph, was established with a mandate to investigate computer conferencing systems currently available on the market, and to select one for purchase. The team looked at such systems as EIES, CONFER, FORUM and COM. The latter was preferred, but as it was not yet ready for commercial purposes and given certain other considerations, the team opted to write their own computer conferencing system based on the COM model. The result was COSY (which stands for Conferencing System). The first prototype of COSY was ready in March 1983 (developed by the Institute of Computer Studies, University of Guelph).

The COSY conferencing system has now expanded beyond its earlier vision of facilitating campus-level academic communication: a significant aspect of the system involves communication with colleagues beyond the University of Guelph. The geographical distribution of the users of the conferencing system includes other parts of Canada, as well as the U.S.A., Sweden, Switzerland, and New Zealand.

Technical Specifications

The COSY Conferencing System is written in the programming language "C". It originally ran on a VAX, Berkeley 4.2, and now runs on an U.T.S. operating system on an IBM mainframe.

COSY is provided as a university resource and, in keeping with this philosophy, is available free of charge to on-campus users. There is, moreover, no charge for CPU time. External users, however, are charged and this is also seen as a means for testing whether COSY provides a useful service to the larger community, and whether a need for or interest in such a service exists.

System Characteristics

Conferences on COSY can be established by any person who has a user account. This person is then referred to as the "conference moderator" and is responsible for the administration and development of that particular conference. The COSY system offers the following services or features:

- conferences (including private, public and group);
- MAIL/Message System (including individual, defined groups and simultaneous messaging). A

public mail or bulletin board service is also available in the form of another conference;

- membership directory with list of users, interests, etc.;
- text editing facilities which include private text editing (the Scratchpad) and group editing (the conference workfile).

Over the past two years, COSY has undergone certain modifications based on experience and new developments/interests. An automatic sign-on procedure that was part of the original design has subsequently been deleted, given the policy decision to include paying users of the conferencing system. The system managers are currently also considering moving away from the simultaneous messaging feature (called CHAT), given users' complaints of being interrupted by CHAT while editing. New features have also been added to the original prototype. The mail/message system is a new feature: the current MAIL was released in October, 1984. COSY is also currently developing mail interfaces/interchanges for NetNorth, BITNET, and MAILNET on and off campus.

The feature most widely used on COSY is the conferencing activity, which is, of course, the "raison d'être" of the system and why people sign on. The COSY messaging system complements the conferencing feature, and is heavily used. There has been a relatively heavy migration away from the MAIL system, on the operating system, to the COSY system. The feature least used on COSY is the conference workfile, which allows group text editing. Private text editing is also not widely used. COSY personnel speculate that the reason for this is that in the age of personal computers, users prefer editing in their own environment rather than being limited to the 1200 baud rate imposed by the modem connection to COSY. The COSY system offers a user interface based on a command-driven system with help commands. The system designers operated on a theory of "user interface", which argues that while a menu-driven interface may be easier for the novice user, it becomes frustratingly limited as the user gains proficiency with the system.

There are currently approximately 240 active conferences on the COSY system. Of these the majority, 128, are confidential or private (that is, they do not appear on a screen list of conferences), 66 are closed (a group conference), and 47 are open or public. Conferences on COSY are predominantly used as administrative communication channels, that is, as electronic meetings or discussions to get a particular job done.

Documentation and Help Facilities

The COSY system has three specialist support staff who provide such services as training trainers and liaising with external (non-University of Guelph) users. There are an additional 10 generalist system support staff at the Institute of Computer Studies who can provide help for COSY users. Documentation for COSY is currently limited to a user manual, but a reference manual and user cards are being developed. On-line help facilities are available in the form of the help menus and an on-line user tutorial entitled "Learn". On-line user consultants are not currently available, but there is pressure from users for COSY to include this help feature. Off-line facilities for COSY users are offered by the three COSY personnel (an advisor phone number is listed), and system manager contact available during working hours. The type of help preferred by COSY users has not been researched by COSY, but personnel opinion was that the type of users which COSY is attracting (first-time computer users) prefer human support when learning the system, and that human contact was an important element in help.

User Characteristics

There are currently about 700 users on COSY. Of these approximately 50% are active users who access COSY between 1-3 times/week, for an average of 10 or more hours/month. The average user, on the other hand, typically uses COSY for 3-4 hours/month.

The predominant users of COSY are the university staff which include teaching and research assistants, researchers. Faculty are the next group, although there are three times more staff than faculty signed on to COSY. The third largest group comprises external users, such as faculty at other universities and civil servants. The smallest group of users is the students (currently between 50-75 users). The reason is that student access is controlled; students are not allowed user names on COSY, except through faculty with grants for that purpose.

The geographical distribution of the users on COSY (as mentioned in the section on Background), although centered on University of Guelph users, extends to users in other parts of Canada (50-60 users), as well as users in the U.S.A., Sweden, Switzerland, and New Zealand.

User Reactions

COSY has not implemented any formal mechanism for evaluating user reactions or preferences to specific or general aspects of the conferencing system beyond a conference to collect comments or complaints about bugs in the system. A conference moderator may do an informal evaluation of his/her particular conference but this is not part of the system. Although questionnaires, subjective ratings, user interviews or computer-collected data on usage have not been implemented to evaluate the system, nor to identify such aspects as usage patterns or user behaviour profiles, COSY personnel occasionally do informal observation of the system and of individual conferences to monitor the process.

Educational Applications

Educational applications of COSY are still in their infancy, although COSY personnel are very interested in this area. Some faculty have used COSY to complement credit courses (both undergraduate and graduate level). In this environment, the conferencing system offers a means whereby: a) the class can have more discussion time; b) administrative activities such as scheduling meetings, can be facilitated; and c) off-campus students can get to know one another (students on-campus have opportunities for face-to-face meetings not available to off-campus students). The problem for off-campus students is the lack of (access to) terminals.

The provision of distance education activities using the COSY system is planned for the near future by the Department of Continuing Education, University of Guelph.

A.3 EIES - New Jersey Institute of Technology

Background:

EIES, the Electronic Information Exchange System, developed out of the EMISARI computerized conferencing system, was the first known attempt to use a computer to structure human communication for information exchange and collective effort to solve a problem (Hiltz and Turoff, 1978, p.41). The EMISARI (Emergency Management Information System and Reference Index) experiment started in the spring of 1970, at the Office of Emergency Preparedness, in the Executive Office of the President of the USA. Research activities begun there were pursued from 1973, at the New Jersey Institute of Technology, by Dr. Murray Turoff, and led to the development of EIES. As a university-based system, EIES has two major stated goals:

1. To provide reliable service to users, which is at the state-of-the-art of computer systems for human communication.

2. To develop and evaluate new features and implementation methods, to advance the state-of-the-art and the understanding of user behaviour in this new medium of communication.

Currently EIES links approximately 2,500 users throughout the U.S.A., Canada, Europe and Australia.

Technical Background

EIES operates on a dedicated Perkin Elmer 3230 minicomputer, with one and a half megabytes of memory and two 300-megabyte disks. It supports 35-40 simultaneous users (although in principle a maximum of 120 users could be accessing the system at the same time). EIES is accessed either by a direct phone call, or through either the TELENET or UNINET packet-switched network. At the time of this study, the charge for EIES is $75(US)/month; the cost of TELENET $9.50/hour ($3.00/hour after 6:00 p.m.) while UNINET charges $7.00/hour at any time. The main interaction program itself is written in FORTRAN.

To accomplish the objective of optimizing the design specific communication structures, the EIES system has two major components from a technical standpoint. In the hard code of the software system are the very general purpose functions for messages, conferences, notebooks and underlying general purpose text file system and word processing. Coupled to this is an interpreter of a special purpose language (INTERACT), which allows for the design of special communication structures and group communication aids to support individuals and groups on EIES. Using this language, special capabilities can be developed, tested, and refined by experience and feedback from the users. As an understanding evolves as to the nature of generally desirable features, these can be incorporated into the hard code to gain efficiency.

Similarly, a specific group arriving at its own communication requirements can then tailor its own clone of the EIES system to provide for its application.

Software Characteristics

The basic EIES system supports electronic messaging, conferencing, personal notebooks, text editing, and document preparation. It includes specialized features such as voting, automated questionnaires, and data-gathering to facilitate group communication processes.

EIES includes the following capabilities in a single, integrated system (Hiltz, 1984, p. 11):

- Message System: The delivery of messages to individuals and/or defined groups. This facility includes confirmations of delivery, a central message file, editing, retrieval, searching and resending, as well as historical analysis of message traffic by individuals.

- Conferences: Linear time sequential transcripts of group discussions on a particular topic with status information on readership. This facility includes voting, text searches, automatic delivery of new material to individual conferees, and other communication support functions. Descriptions of open conferences are listed in a public conference, and an individual may join any number of conferences.

- Notebooks: A text composition and word processing space that may be private to an individual or shared among a group of users. Provides features for organizing and distributing documents as well as automatic notification of modifications.

- On-Line Directory: A membership directory that lists both individuals and defined groups, with self-entered interest descriptions and numerous search options. A defined group may be treated as a single individual for the purpose of sending a message.

- Text Editing: Editing for individual and group composition, and distribution of reports and papers.

- Custom Communication Structures: These may be built according to a group's needs (for example, project planning and tracking on a group basis).

- Special Purpose Capabilities: For voting and surveys or accessing data bases, using a high level language ("Interact") facilitates the development of special capabilities needed by any one group. Users may choose any one or two of nine alternative voting scales that can be attached to a conference comment. The computer collects and displays the vote distribution for the members of the conference.

Messages are either private or group messages, and conferences and notebooks may either be private, group, or public. Private conferences and notebooks are controlled by an individual user who determines the participants. Group conferences and notebooks are controlled by defined groups on EIES, while public conferences or notebooks are available to anyone on the system for reading. Public notebooks have a defined set of authors (restricted writing), but anyone can read in them.

All the text items in the above subsystems are compatible and readily transferable (for example, message may be transferred into a conference comment or notebook page). All of the subsystems exist within the context of a single user interface that provides four different modes of user interaction. These are:

1. Menu Selection: The user selects an option from the one page guide to the major EIES menus.
2. Command Driven: All the menu selections are available as commands. In addition, approximately 2 advanced features not available in the menus can be utilized.
3. Answer Ahead and Command Streams: The user can anticipate questions and answer ahead, or trigger a sequence of operations. The EIES interface is fully predictable to the user, and all commands are usable at any point in the interaction.
4. Self-defined Commands: The individual user or a group coordinator can define commands unique to the individual or group. There are facilities for defining commands that will request necessary specifics at the time they are executed.

EIES also allows the development of specialized subsystems for specific tasks. This has been utilized in areas such as: legislative information exchange, standards setting, project management, and social experimentation and forecasting.

Documentation and Help Facilities

The New Jersey Institute of Technology suggests that new users can learn the basics of the system in less than an hour. EIES offers a variety of HELP features which include: hard copy documentation; an on-line explanation system which contains specific explanations of all system files, and which documents the most recent changes to the system; and on-line "user consultants" available to answer more involved questions as well as help new users. (User consultants are volunteers who help others to learn to use the system and who also serve as information brokers on activities taking place on EIES.) Hiltz (1984, p.117) has reported that the on-line user consultants have been rated by users as the most valuable of the various on-line help aids, at all levels of user expertise.

The Conferencing Center at the New Jersey Institute of Technology currently has a full-time staff of 10-12 personnel, including technical, educational and administrative officers.

USER REACTIONS

The system has been constantly evolving largely as a result of feedback from users. Numerous extensive formative evaluations of the system have been undertaken to assess: reactions to the system (which include such features as documentation and help features; user interfaces); determinants of use; usage patterns; subjective satisfaction ratings, and the design implications of these. The results of these evaluations have not only been fed into shaping the system, but have also been published and disseminated internationally in reports, articles and books (see bibliography for a partial list).

Educational Applications

Over the past three years a number of undergraduate and graduate level courses in the continuing education program at the New Jersey Institute of Technology have been conducted using the EIES system. Other groups, outside of the New Jersey Institute of Technology, have also leased time on EIES to deliver university-level courses.

A.4 FORUM at the University of Alberta

Background

FORUM was obtained from the University of British Columbia, where it had been developed in response to the need for a low-cost, easy-to-use conferencing system for internal and external users of the university's computing resource. The system runs on the University of Alberta's and University of British Columbia's computers. Both of these universities are part of the Michigan Terminal System (MTS) at the University of Michigan. FORUM has been running on the University of Alberta's computer for over two years and is still under development. Software changes are announced within the program itself.

Technical Specifications

FORUM was written in Assembler Language, and runs on the University of Alberta's Amdahl 58/60 computer under the VM operating system. The cost is free to internal users at the University of Alberta, but there is a small cost for external users.

System Characteristics

Conferences can be established by any authorized user of the University of Alberta computer. Anyone wishing to start a new conference simply uses the CREATE command within FORUM and assigns a 1-25 character descriptive name to their conference. This organizer is also responsible for entering a one-line comment about the conference (to guide prospective, interested participants), and for establishing access permission for other users. For example, some people may be designated as full participants, having both read and discussion privileges, while others may be permitted only to "observe" the conference proceedings but not enter comments.

Alternatively, the University of Alberta's system consultant can be requested to establish a new conference. In addition, he/she can and does administer many of the existing conferences on the system. If he/she is required to spend a great deal of time administering a particular conference, the conference organizer will be charged a fee for his/her time.

Software Characteristics

The following services are available within FORUM and or at the operating system level:

- Conferences: Both private and public conferences are available on FORUM and all are asynchronous. Once users have joined more than one conference, they are automatically in "multi-conference" mode which means that they will be informed of new items in any conference of which they are a member. Users can switch back and forth from one conference to another easily or can restrict their activities to a specific conference.

- FORUM: The program provides a simple keyword mechanism which is intended to help users find all discussions on various topics. The keywords can be phrases rather than just single words. In addition, keywords can be typed into a file and accessed directly while the user is running FORUM. Thus, new keywords can be added to the file or deleted through use of a text editor, and the keywords used many times without the need for continual retyping.

  There are also sophisticated search mechanisms by which users can locate conference discussions and have these contents directed to files for printing.

- Message System: A messaging system is available on FORUM although its use is de-emphasized, because a much better system called $message can be accessed at the MTS operating system level. The $message program permits communication between individual users and defined groups. There is no bulletin board system on the computer as FORUM itself is perceived as satisfying that function.

- Membership Directory: There is a membership directory within FORUM that lists user names and interests. At the MTS system level there is another membership directory that lists user names only.

- On-line Databases: There is no direct access to on-line databases from within FORUM. However, users can access, search, retrieve, and print results at the MTS operating system level from the ERIC database (all titles since 1979 are stored online at the University of Alberta). In addition, there is an on-line prompting program to assist users inexperienced in on-line database search techniques.

- Text Editing: There is an MTS line editor available within all systems. This editor permits context searches as well as the insertion, deletion and replacement of text. A full-screen editor, "V", is available to local University of Alberta computer users, but is inaccessible to remote users accessing the computer via Datapac (this is a restriction of packet-switching networks, not something imposed by the University). There are no provisions for group editing.

- University Library Catalogue: There is no access to the catalogues of the University library from within FORUM, but access is available at the MTS operating system level.

The most widely used features on FORUM are the simple "read" and "respond" functions. More complex functions such as editing keywords, or modifying discussion titles are used less frequently. At the MTS operating system level, the most commonly used feature is the "$message" program. FORUM operates through the use of commands; there are no menus, and user-defined commands are not permitted. Commands can, however, be shortened to a couple of letters and several commands can also be strung together.

The types of conferences that have been established on the system are many and include: information about microcomputers (including technical specifications); how to use CONFER; policy for Canadian data archives; administration of non-profit organizations; and a conference initiated by this project, on computer conferencing for distance adult learning.

Documentation and Help Facilities

While provisions for immediate access to on-line user consultants have not been established for FORUM, system managers can be contacted through the "$message" program. However, since this is not an interactive process, there is some time lag between a problem's description and receipt of an advisor's reply. There is extensive on-line help available both within FORUM and at the MTS operating system level. Off-line help facilities include access to an advisor and the system manager via telephone. These consulting services are available 12 hours per day, 7 days per week. Most users seem to prefer using the telephone to receive help. However, if a user decides to visit the consultant offices, advisors prefer that the he/she bring hard-copy printouts showing the problem cause and result. With a printout as a reference tool, it is much easier for consultants to explain errors or problems experienced by users (while using the computer), and to suggest solutions.

In addition to off-line user consultants, printed documentation is available for FORUM. The documentation is generally sketchy, giving only minimal information, and providing no illustration of error messages and their meaning. There are no suggestions for getting started, and no examples of "good" conferences.

User Characteristics

There are a great number of users on the FORUM system; these include university faculty, staff, students, non-profit and commercial users. The majority of the system users are in Edmonton, although the next largest user group is located in Northern Alberta, at Athabasca University. There is high Datapac traffic, however, and users are found all across Canada.

User Reactions

There are no formal evaluation mechanisms for FORUM, although there is a facility called *SUGGEST, which is available at the MTS operating system level. This program is a catch-all for any system complaint, however, and is not specifically intended for FORUM users. The only other mechanism for registering complaints is via telephone to the system manager.

There are no generalizable usage profiles available for FORUM. The activity monitored most closely at the MTS system level has been the use of the ERIC database, but this information was collected primarily to determine the advisability of making ERIC available locally.

User participation in a conference can best be motivated by keeping the conferencing system software simple and easy to use. For example, on-line help aimed at the level of the user would be very advisable. This implies the availability of some system "intelligence", in order to determine the experience level of the user and tailor help accordingly.

Educational Applications

FORUM has not (to date) been used at the University of Alberta in courses, but the "$message" system has helped supplement communication between instructors at the university and Athabasca University. Most distance education courses from Athabasca University have, however, relied more on the use of tutors and telephone contacts. There is some interest by some people in using FORUM in distance learning courses in the future, although others contacted during this study believed that conferencing would not be a useful addition to existing delivery mechanisms.

Appendix B

DESCRIPTIONS OF COMPUTER NETWORKS

B.1 EDUCOM at Princeton, New Jersey

Background

EDUCOM is a non-profit organization located in Princeton, New Jersey. It was founded in 1964, by people in higher education who believed that scholars could be linked together through the use of information technology. The goal of EDUCOM has been to promote interuniversity cooperation in the application of system technology. The various services offered by EDUCOM include conferences and seminars, publications, cooperative activities, and the networking facilities of EDUNET, MAILNET, and BITNET.

EDUNET is an international network established to facilitate the sharing of computer-based resources in higher education and research. It became operational in the fall of 1977. Through its network facilities, faculty, staff, and students can access computing facilities at more than a dozen different university computer centres.

MAILNET provides a cost effective means for professionals at over 300 universities including ones in Canada, Britain, and Europe to communicate via electronic mail. MAILNET became operational in the fall of 1983.

The BITNET Network Information Center has been housed at EDUCOM since June 1984. The BITNET software was originally developed at the City University of New York. The new Center was established to provide a network planning and user support institution, as well as software for storing and forwarding electronic files to over 400 computers at 168 institutions.

Technical Specifications

The central EDUCOM computer is a Digital Equipment VAX 11/750 which is used for word processing, database management, electronic mail and for connection to other computers via MAILNET and BITNET.

BITNET uses an IBM 4361 mainframe computer with associated laser printers, and IBM microcomputers. MIT is acting as the gateway into this network, which now includes 64 universities with 200 connected computers.

MAILNET provides gateway access to a variety of major networks such as ARPANET, CSNET, CCNET, and JANET (in the United Kingdom). At present MAILNET's interconnection facilities are used on 13 different types of computers, 10 different operating systems, and 11 mail or conferencing systems.

EDUNET does not own or operate a computer, but rather it arranges for the supply of computing resources from a variety of computing centres. For electronic linkages between network members, EDUNET relies on commercial data communications networks such as GTE, Telenet, TYMNET, or Datapac from Canada via a gateway into American systems.

System Characteristics

The characteristics of the EDUCOM components can be described as follows:

- EDUCOM: provides evaluation and recommendation of administrative, research, and instructional uses of information technology; strategic planning and budgeting; organization, management, and staffing; hardware and software selection, acquisition, and implementation; proposal reviews and on-campus workshops.

- EDUNET: provides access to electronic mail, computer conferencing, and telecommunication services; directories, documentation, account initiation, and billing for remote users of 18 major university computing centres. Resources available via EDUNET include tutorial programs in the humanities, sciences, and professional studies; CAI authoring languages; statistical packages; subroutine libraries; extensive databases; information storage and retrieval; programs for textual analysis; and graphics software. In addition, users are offered access to both the EIES and COM computer conferencing systems.

- MAILNET: provides an international network linking electronic mail and conferencing systems for communication among scholars, researchers, administrators, and faculty. MAILNET software allows people to use the MAIL system at their own university and have their communication routed to other institutions. At the receiving university, the electronic message is translated into the host computer's messaging system. Through this mechanism users do not need to learn new commands for other messaging systems; they simply use the familiar messaging software on their own computer and the network looks after transferring and formatting the message for whatever messaging system is available at the destination site. MAILNET runs on a variety of computers including VAX's. In order to become a MAILNET member, a user must join EDUNET. There is an on-time implementation fee of $2,000.00, a monthly service fee of $170.00, and usage charges (U.S dollars). These latter fees are dependent on message length.

- BITNET: is an international computer-to-computer communications network for higher education and research. Through its facilities, on-line directories, paper and electronic newsletters, end-user documentation, workshops, seminars, conference presentations, and other information can be shared and transferred electronically. Most of these facilities are still, however, under development.

Documentation and HELP Facilities

EDUNET has a central staff which is always available during regular office hours (Eastern Standard Time), regardless of the nature of the user problem. If the problem requires detailed knowledge about a system, or resource, available at one of the participating universities, the caller will be referred to a local EDUNET liaison person or some other advisor at the supplier site. EDUCOM also sponsors a number of regular publications including the EDUNET News (quarterly), EDUCOM Bulletin (quarterly), and the EDUCOM Computer Literacy Newsletter. A variety of documentation is available for software which includes resource fact sheets, sample sessions showing typical client-computer interactions, and user manuals specifically designed for the remote use of software.

MAILNET conducts seminars to introduce new users to its use. The seminars also concentrate on how the MAILNET service fits into existing campus computing and communication environments. In addition to initial training, there is a full-time Network Services Consultant at Princeton, as well as people designated as "postmasters" at each participating institution. Should a user wish to communicate with a colleague at another university, and not know that person's computer username, the local postmaster can be contacted and will find and send information to the original requester. BITNET plans to initiate an on-line user directory, through which usernames and addresses of colleagues can be located much like in a telephone directory. In addition, the CUNY Center will be providing software development and systems programming, as well as technical consulting support for BITNET institutions.

User Characteristics

EDUNET has evolved from a development project to a self-sustaining network involving 150 institutions. The MAILNET project grew from 16 pilot sites to an operating network of 27 institutions, with gateways to 300 others. It is, for example, estimated that there are 6,000 MAILNET users. The BITNET Information Center is just beginning its work, having been in operation for only one year, but as stated earlier it maintains links with over 200 universities. All of these facilities reach, therefore, an enormous number of users at universities all over the continental United States, Hawaii, and Canada as well as in Europe. Specifically, there is direct network access to the COM computer conferencing system at the QZ Computing Center in Stockholm, Sweden, and direct MAILNET access to the University of Durham and the University of Newcastle, in England. Users are, therefore, as diverse as one would expect such a large body of people to be. The common link, is that because of the purpose of EDUCOM, to link colleagues in higher education and research, all users are located at universities, colleges, or research institutions.

User Reactions

EDUNET conducts user surveys through its liaison personnel at member universities. EDUNET services are rated according to usage and perceived importance by users. More specific EDUNET surveys, including an on-line survey, are in the planning stages. MAILNET sites, local computers, operating systems, local mail systems, sitenames, liaison personnel, liaison address, and postmaster address have been published in the EDUNET News. In addition, users are invited to forward any problems or requests to postmasters at local sites or to contact the MAILNET coordinator at Princeton.

Educational Applications

While all of the activities of EDUCOM are concerned with linking educators at university institutions, there have been various applications specifically aimed at learning. These have included the following:

- Social scientists in Hawaii, Oregon, and France participated in a seminar using the EIES computer conferencing system.
- Law school faculty, at two different campuses, relied on EDUNET to jointly develop an expanding set of CAI programs at the University of Minnesota. These programs are being used by students in over 20 American law schools.
- An educator in Appalachia used programs in Minnesota to train his students in diagnosing adult illiteracy problems.
- Administrators at more than 80 colleges and universities use "EFPM", a financial planning and modelling system at Cornell.

The potential applications for such a comprehensive learning network, as is available through EDUCOM, are enormous.

B.2 iNet 2000 - Telecom Canada

Background

The iNet 2000 computer network was developed by Bell Canada, with programming for the system being done by Northern Bell. The network was developed in response to a perceived need for some mechanism to assist users of multiple databases. This is because each information provider requires a new user to sign a contract (sometimes people are also requested to make an initial investment of several hundred dollars' worth of use), and access protocols for each computer system are different. In addition, the search techniques for each database are not the same. For example, using the information resources of InfoGlobe would require a completely different contract, access protocols, and search commands than if a person wanted to obtain information from the ERIC database. As a result, iNet was an attempt to alleviate some of these difficulties by providing users with single access to their network, and then through menu selection to a variety of databases. In effect, iNet acts as a central switchboard.

A one-year technical field trial began in 1982, with extensive market trials beginning in 1984 and continuing until August 1985. The system is being improved on a continual basis, with enhanced features being added regularly. In August 1985, Telecom Canada will apply to the CRTC for permission to offer the service commercially across Canada.

Technical Specifications

The iNet service runs on a Tandem computer under the operating system "Guardian." The main computer is located in Toronto, and all calls are routed through this computer into those of the information providers. Programming for the network was done in a language called "TAL."

During the market trials the fee structure is as follows. Users are charged according to whether they are corporate or private consumers. Corporate users pay an installation fee of $50.00, plus a monthly charge of $50.00 ($600.00 per year), and $5.00 per registered user. Private users pay an installation fee of $25.00, and a monthly charge of $5.00 per registered user. There is an additional fee of $3.60/hour during prime time (7 a.m. to 7 p.m. local time), or $2.70/hour during non-prime time for accessing iNet. Users also pay whatever rate information providers charge for their services, although iNet will consolidate fees and provide one monthly bill. (For example, InfoGlobe charges $3.00 per minute to search its database.) The information providers themselves pay $50.00 per account for the right to supply to iNet.

System Characteristics

INet provides access to a variety of information services including the ENVOY 100 electronic mail service. While iNet does allow users to access a plethora of information sources, no mechanism has been developed to facilitate searching individual databases. Each information provider still requires users to learn its own procedures, and other than the switching function, iNet provides no assistance with the more difficult tasks of information retrieval.

On the iNet service, there are three directories the user can choose. When first accessing iNet, a user is automatically in the National Directory which lists all the information service providers, and databases available. For each service, the national directory provides a description of contents, information about access rates, hours of operation, and notes on how to use a particular database. There is an organization directory which lists all services accessible by members of an organization, so that services to be used by its employees can be regulated. In the third directory (personal directory), users can maintain a list of services they use on a regular basis.

When they join iNet, users can specify if they wish to have their password changed on a regular basis, and this will be done automatically by the iNet administrators. The network recognizes almost any kind of terminal, including those supporting French keyboards, or Telidon videotex. There are, however, very few services which use the Telidon features available through iNet. Types of services available include:

- Conferences: INet plans to offer the COSY conferencing system as part of its commercial service.

- Message System: The Envoy 100 mail service can be accessed from iNet. This electronic mail system is very easy to use, and permits messages to be composed, edited, reviewed, forwarded, deleted, etc. People can access an on-line directory of user names in order to be able to contact colleagues. The National Library of Canada has selected Envoy as its standard for inter-library communication.

- Bulletin Boards: It is possible to establish a bulletin board for use within a particular organization, or to make it available to the entire iNet system. These are called Notice Boards and have been used, to some extent, by schools in Manitoba.

- Membership Directory: A membership directory is available within Envoy and can be searched by name or organization.

- Text Editing: INet offers access to text editing facilities through a program called Interworking. This editor operates either in line or full-screen editing mode. In addition, up to 12 people can share the same workspace at the same time.

- University Library Catalogue: On-line library catalogues are available for Carleton, Waterloo, Guelph, and the University of Quebec. These can be searched by title, subject, or author.

Documentation and HELP Facilities

INet has been designed to accommodate users with various levels of on-line experience by providing three levels of user interface. These include:

- Simple Interface: This is designed for the beginner and provides the user with a one-line prompt, and indicates the most appropriate action to be taken at the time.

- Menu Interface: This is designed for the intermediate user, and provides a menu selection of the most appropriate commands as well as one-line prompts.

- Command Interface: This is designed for the experienced user. In addition, personalized log off commands can be defined and stored within an individual user profile. Also, individual interface styles can be changed at any time in the user profile.

All new iNet users are invited to attend a free, one-day training course which provides them with a working knowledge of system features and commands, as well as a basic introduction to Envoy and videotex services. In addition, each user is supplied with a copy of the user guide which indicates how to access datapac and iNet, plus the databases, and gives cost breakdowns.

There is extensive on-line help available. At any time during a session, a user can enter "HELP" for immediate assistance, and be provided with a list of commands most suitable for use in that context. Also, a Customer Assistance Centre is available nationwide during office hours and offers free assistance. After hours there is an answering service, and calls will be returned as soon as the service opens. The customer service department has a tracking system for these calls, so that problems can be checked and solved quickly.

User Characteristics

There are, at present, approximately 2300 users of the iNet facility. INet users include people from government agencies, non-profit organizations, education, lawyers, and business people, but the largest user group is the legal profession in the province of Quebec. The majority of all users are in Ontario and Quebec, with the next largest concentration being found in British Columbia and Manitoba.

User Reactions

User suggestion boxes are not available, but people are encouraged to send messages to the customer assistance centre ID. In addition, new users are telephoned after they have used the service for a couple of months, and are asked a number of questions about their experiences. During the market trials there have been evaluations in which telephone questionnaires were conducted with users. INet planners had considered employing an on-line questionnaire to collect user reactions, but this was not done, and the telephone technique was employed instead. It has been found that new users tend to access the service frequently at the beginning, but then the number of sessions and the time per session tends to decline over time. It was not known whether people found the services too expensive, or whether they were simply more efficient at finding what they needed.

Database access and messaging system use are split about 50-50 on iNet. Also, access to financial information is considered important. There have been varied reactions to the database access facilities; some people have liked the features while others have felt it is too expensive.

Educational Applications

There are few educational features available through iNet, although there is considerable interest in providing services to teachers and students. The greatest use of iNet for educational applications has occurred in Manitoba, where there has been use made of Report Boards to share information between schools. In addition, there are computer-assisted instruction units for grades 2-8 science and mathematics, and some Manitoba schools have been teaching information retrieval skills. However, the cost of using iNet, plus the cost of accessing many commercial databases remains prohibitively high.

Appendix C

EXAMPLE DATABASE MANAGEMENT REPORTS

C.1 Reactions to Conferencing - Documentation

Variable Name	Type	Width
ID	N	2
REACTOPMS	N	1
Q2DOCU	L	1
Q2DOCUCOM	C	50
Q2SOFT	L	1
Q2SOFTCOM	C	50
Q2HARD	L	1
Q2HARDCOM	C	50
Q2SP	L	1
Q2SPCOM	C	50

REACTIONS: 1=POSITIVE: 2=NEUTRAL; 3=NEGATIVE

Note: N = numeric; L = Logical(true-false); C = character

C.2 Reactions to Conferencing - Software Comments

ID	REACTIONS	SOFTWARE COMMENTS
1	positive	software worked well
3	neutral	poor text editor; threading would have been useful
4	neutral	clumsy text editor; good search routines
7	positive	system easy to use
8	positive	cumbersome software; ENVOY messaging very good & simple
9	neutral	poor text editor
10	positive	system informs of new mail; difficult editor
11	negative	threading would have been useful;
12	positive	hard to learn system typing keeps you on-task; improves efficiency
13	positive	better keyword searching needed; threading capabitilites needed
14	neutral	complicated software system; no scanning of items possible; system informed of mail received
17	neutral	poor text editor; didn't like linear organization items
18	positive	good reactions
19	positive	system worked well

C.3 Reactions to Conferencing - Social Psychological Comments

ID	REACTIONS	COMMENTS ON S-P FACTORS
6	positive	met lots of people; good information exchanged; more privacy to work
9	neutral	ccs didn't work when there were time deadlines
10	positive	facilitates real human interaction; inability to type is a limitation
11	negative	did not feel part of group; found the interaction artificial
13	positive	not as good if people geographically close
17	neutral	liked group work on documents
18	positive	good discussions
19	positive	some people monopolized conversations; typing ability is a factor

C.4 Network Database - Documentation

Variable Name	Type	Width
ID	N	2
SEX	N	1
POSITION	C	9
USER_TYPE	N	1
MESSAGING	L	1
CONFERENCE	L	1
TEXT_EDIT	L	1
DATABASE	L	1
COMMENT	C	40

SEX: 1 = MALE;2 = FEMALE
USER_TYPE: 1 = EXPERIENCED; 2 = SOME EXPERIENCE; 3 = NONE

ID	N	2
MOTIVATION	N	1
CURIOSITY	L	1
NEW-TOOL	L	1
RESEARCH	L	1
TASK	L	1
PUBLISHING	L	1
PRELATIONS	L	1
COURSE	L	1
COMMENT	C	100

MOTIVATION: 1 = PERSONAL; 2 = PROFESSIONAL; 3 = BOTH

ID	N	2
REACTIONS	N	1
Q2DOCU	L	1
Q2DOCUCOM	C	50
Q2SOFT	L	1
Q2SOFTCOM	C	50
Q2HARD	L	1
Q2HARDCOM	C	50
Q2SP	L	1
Q2SPCOM	C	50

REACTIONS: 1 = POSITIVE; 2 = NEUTRAL; 3 = NEGATIVE

ID	N	2
Q3DOCU	L	1
Q3 DOCUCOM	C	50
Q3SOFT	L	1
Q3SOFTCOM	C	50
Q3HARD	L	1
Q3HARDCOM	C	50
Q3SP	L	1
Q3SPCOM	C	50

ID	N	2
Q4	L	1
Q4COM	C	50
Q5	N	1
Q5COM	C	50
Q6	N	1
Q6COM	C	50
Q7	N	1
Q7COM	C	50

Q4: T = YES: F = NO Q5: 1 = COST: 2 = SOFTWARE FEATURES; 3 = N/A (HASN'T STOPPED); 4 = TASK COMPLETED; 5 = S-P; 6 = COMBINATION Q6-Q7: 1 = YES; 2 = YES, BUT; 3 = NO; 4 = NO, BUT; 5 = NEUTRAL

ID	N	2
Q8PD	N	1
Q8PDCOM	C	100
Q9DE	N	1
Q9DECOM	C	100

Q8PD-Q9DE: 1 = EXCELLENT; 2 = GOOD; 3 = MAYBE; 4 = NO

ID	N	2
Q10SOFT	L	1
Q10SOFTCOM	C	100
Q10HARD	L	1
Q10HARDCOM	C	100
Q10SP	L	1
Q10SPCOM	C	100
Q10PEDA	L	1
Q10PEDACOM	C	100

ID	N	2
Q11	L	1
Q11COM	C	50
Q15	L	1
Q15COM	C	50

Q11-Q15: T = YES; F = NO

ID	N	2
Q12SOFT	L	1
Q12SOFTCOM	C	100
Q12HARD	L	1
Q12HARDCOM	C	100
Q12SP	L	1
Q12SPCOM	C	100
Q12PEDA	L	1
Q12PEDACOM	C	100

ID	N	2
Q13COM	C	1

ID	N	2
Q14SOFT	L	1
Q14SOFTCOM	C	100
Q14HARD	L	1
Q14HARDCOM	C	100
Q14SP	L	1
Q14SPCOM	C	100
Q14PEDA	L	1
Q14PEDACOM	C	100

NOTE: N = Numeric; L = Logical (true-false); C = Character

Appendix D

STRUCTURED INTERVIEW FORMS

D.1 Educator Interview Form

Name and Position of Contact	Date
Affiliation	Address
Position	Phone number

Background

1. Have you had any personal/professional experience using computer conferencing systems?
2. If yes, which systems have you used?
    a. Number of times accessed? For example,
        - .5 or less
        - .5 to 20
        - .more than 20

    b. What motivated you to use the conferencing system?

    c. What services did you use most? For example,
        - .messaging
        - .conferencing
        - .text editing
        - .databases

    d. What were your reactions to the system? For example, what worked? What didn't?

    e. What changes would you liked to have seen implemented?

    f. Were you ever asked to evaluate specific conference(s) or the conferencing system itself?

    g. Why did you stop using the system (if you did)?

    h. Would you recommend this particular conferencing system? Why or why not?

    i. Would you recommend conferencing systems in general? Why or why not?

Educational Applications of Conferencing Systems

1. What do you consider to be the potential for distance professional development through a computer conferencing system?

2. What is the potential for distance education through a computer conferencing system?

3. Have you any suggestions for designing distance education activities using a computer conferencing system? (For example, Computer Mediated Learning (CML) vs Computer Aided Instruction (CAI).)

4. Do you think that it would be useful to be able to access a database from the conferencing system?

5. Have you any suggestions for structuring a computer conferencing system for distance education (i.e. the essential ingredients, the pitfalls)?

6. How would you motivate user participation in computer-based distance education courses?

7. How would you maintain user participation in computer-based distance education courses?

8. Can you recommend any articles, books, or references on computer conferencing systems and distance education?

Version 1 - December 1984

D.2 System Manager Form

Name of Computer Conferencing System	**Date**
Name of University	**Address**
Name and Position of Contact	**Phone number**

Background

1. Why was the computer conferencing system obtained?
2. From where was it obtained?
3. How long has the computer conferencing system been operational?

Technical Specifications

1. In what language is the computer conferencing system written?
2. On which computer(s) is the conferencing system running at this university?
3. On which operating system(s) does the computer conferencing system run?
4. What is the cost structure for users?

System Characteristics

1. How (including by whom) are computer conferences established?
2. Who is responsible for administering individual computer conferences?
3. Which of the following services are available? (For each of the features cited below, please put a + before services subsequently added to the conferencing system or a - before services deleted. Please explain any additions or deletions.)

	within the c.c.s.?	on the computer system?
Conferences		
private		
public		
group		
synchronous		
Message system		
individual		
defined groups		
public (bulletin boards)		
Membership directory		
with names, interests, etc.		
On-line databases		
ERIC		
Text editing facilities		
private		
group		
University library catalogue		
Other (specify)		

4. What are the most widely used features on the conferencing system, and why?

5. What are the least widely used features on the conferencing system, and why?

6. What types of user interfaces are available on the conferencing system?

   For example:

   .menus

   .answer ahead

   .system commands

   .user-defined commands

7. What types of conferences have been established at your institution?

   For example:

   .academic

   .public interest

   .non-profit organizations

   .student courses

   .other (specify)

Documentation and Help Facilities

1. What is the number and type of support staff?

2. How extensive is the online, or offline, documentation for users? For example, would users be able to find information easily on:
   - .system access protocols (i.e., how to log on, how to access the computer using packet switched networks);

   - .services available on the conferencing system (e.g., messaging within the conference, how to find public conferences, shared text editing workspaces);

   - .services available on the computer system (e.g., access to online databases, access to text editors, access to statistical packages);

   - .system usage (cost structures, online help);

   - .other (specify).

3. What on-line help facilities are available for how many hours each week? (i.e., user consultants help menus.)

4. What off-line help facilities are available and for how many hours each week? (i.e., advisor phone number system manager contact other) Specify.

5. Which types of help seem to be most preferred by users?

User Characteristics

1. How many people are using the conferencing system?

2. What are the different categories of users? For example,

   .university faculty

   .students

   .university staff

   .others (specify)

3. What is the geographical distribution of the users?

User Reactions

1. Are there mechanisms to evaluate user reactions/performance to:

   .conference manager

   .help features

   .individual conferences (what aspects?)

   .total system (what aspects?)

   .user interfaces

   .other (specify)

2. How often are evaluations done?

3. What data collection methods are used? For example,

   .on-line questionnaire

   .subjective ratings

   .user interviews

4. What have been rated as the most valuable features on the system?

5. Have usage patterns been established? If so, please indicate (on a monthly basis) patterns for the following system features:

	average hours	# of times accessed
Conferencing system		
Databases		
Distance education		
Help		
Message system		
Newsletters		

6. Is there a generalizable usage profile for:

   .an individual on a conference (i.e. when is the period of most frequent activity?; what is the evolution of user behaviour?)

   .a conference (when is there the most activity?)

7. What motivates user participation?

8. What criteria are key to a "good" conference (i.e., what is a "good" as opposed to a "bad" conference)?

EDUCATION

1. For which educational applications is the conferencing system being used now?

2. What are the foci of the current educational applications?

   For example:

   .professional development

   .credit/non-credit courses

   .university staff development

   .distance education (credit/non-credit courses)

   .other (specify)

3. What do you consider to be the potential for professional development through the conferencing system?

4. What is the potential for distance education through the conferencing system?

5. Do you have any suggestions for structuring a computer conferencing system for distance education (i.e., the essential ingredients, the pitfalls)?

6. How would you motivate user participation in distance education courses?

7. How would you maintain user participation in distance education courses?

8. Can you recommend any articles, books, or references on computer conferencing systems and distance education?

Version 2 - February 1985

Appendix E

EXAMPLES OF COMPUTER MESSAGING AND CONFERENCING

E.1 Envoy100 Mail System

```
User-id/Code d'usager: INET.DEMO13
Password/Code de sécurité:

Welcome to iNet 2000
Last log on time: 1985-03-05  23:40:13 EDT
Customer Assistance Centre

1-800-267-8480 (BC) 112-800-267-8480
**************************
News last updated 85-02-21

ORIGIN MENU
1    Guide to using iNet 2000
2    iNet 2000 NEWs
3    List the National directory
4    List your Organization directory
5    List your Personal directory
6    Change/view your PROfile
7    Change your PAssword
8    iNet 2000 Messaging

Please enter a number to continue:  8

Welcome to iNet 2000 Messaging.
Your last access was Tuesday, March 5, 1985  10:40 PM

To end your messaging session, please use your 'escape sequence'.
No new messages.

Command?  scan all

No.   Delivered       From          Subject               Lines

1     Feb 24 14:13    MAIL13        RE: test message        1
2     Feb 24 14:39    INET.ORDERS   Request for            13
3     Feb 26 16:08    M.MACLAREN    RE: couple questions   18
4     Mar  5 22:42    MAIL13        research proposal       4


Command?  bye


This ENVOY 100 session is now complete.


ORIGIN MENU


1  Guide to using iNet 2000
2  iNet 2000 NEWs
3  List the National directory
4  List your Organization directory
5  List your Personal directory
6  Change/view your PROfile
7  Change your PAssword
8  iNet 2000 Messaging

Please enter a number to continue:  bye

Log off iNet 2000 - Good-day
Log off time: 1985-03-06  23:19:02  EDT
```

E.2 COSY Mail System

Memo #9019
From: mjohnson on COSY
Date: Thu, 28 Feb 85 21:51:25 EST
To: forresnz

Message-Id: <memo.9019>

Hello -- My name is Marcia Johnson at the Ontario Institute for Studies in Education. I have a research project, with the Ontario Ministry of Education, to investigate educational applications of computer networks and conferencing systems for adult distance education and professional development of teachers. I was interested to see that someone from New Zealand was logged on to COSY. Are you in fact, logged on from New Zealand? Have you direct satellite communication with Canada, or do you have to dial long distance to a remote node? Do you know of any educational applications of computer conferencing in New Zealand? Sorry for all of these questions, but I am in the position of being an "information collector" and like to make whatever contact I can with people on this system.

Memo #9163
From: forresnz on COSY
Date: Sun, 3 Mar 85 15:52:59
EST To: mjohnson
In-Reply-To:
<memo.9019> Subject:

marcia, will fully describe this link from nz in the next day or so. it works very simply and very well.
keith.

Memo #9257
From: forresnz on COSY
Date: Mon, 4 Mar 85 22:30:23 EST
To: mjohnson
Message-Id: <memo.9257>

reply to your questions in memo 9019 yes, we are logged on from the forest research institute, rotorua new zealand. as far as i know we are connected via satellite to the us (rca network), and then to canada. we are still using oasis/tymnet, but should be changing to packet switching soon. as for educational applications in nz we are not exactly the best people to ask, as we are not directly connected with a teaching institute. the only information i could come up with, in this area, is that we think massey university uses some sort of computer conferencing for extramural study. you would probably be best to contact nz universities, institutes, etc., for further information.

diane steward

E.3 FORUM Conference on Distance Education

415. teleconferencing for distance education
Marcia Johnson 14:44 Wed Dec 12/84 10 lines

This conference is intended as a means to discuss possible applications for computer conferences in distance education for teachers/trainers. It seems that one of the most problematic features of conferencing systems is that they are not reflexive. If a student has a problem, and requires an immediate response, there is little possibility of obtaining such help within the conferencing system. This means that its use as a tutorial aid is limited. Such questions as the role of the conference moderator need to be examined closely.

415/1. Walter Archer 21:46 Wed Jan 16/85 9 lines

The state of Alaska has had several years of experience in using a distance education system in their remote secondary schools which involves computer conferencing. If you write to them, they will send you a couple of booklets which tell you more than you ever wanted to know about their system. The address is:

Ed Obie
Dept. of Education
Pouch F
Juneau 99811

415/2. Marcia Johnson 20:19 Thu Feb 7/85 4 lines

Thanks for the address. I'll drop them a line and see what materials they have to offer. I'll let you know what types of information they have, and pass that along to you when I get their reply.

415/3. Denis Chalifoux. 12:02 Sat Apr 13/85 30 lines

I believe that it is at least a step in the right direction to explore the possibilities of electronic mail and conferencing for long distance education. If one considers the normal type correspondence courses and the time lag of the mail system, the expense of long distance phone bills to try to overcome the problem and the need for (almost) immediate consultation when a student encounters a problem, I can see a great advantage of even electronic mail that may have only, say, a 24 hour time-lag. I use electronic mail all the time, between myself and my faculty consultant, because we simply are both so busy that we sometimes can't connect in any other way.

The concept of having a student call up some mainframe, download a course segment, run through it, respond to questions, either review or quiz type, SHOULD ALSO INCLUDE a sort of immediate "chat" mode that the student can easily switch to, in order to ask his "teacher" (wherever he may be) a question AS IT ARISES, and before he forgets. I suspect that at the end of the tutorial or whatever, the student may have forgotten some of his thoughts. This way, at least, the tutor has the questions from the student, although he may not be able to respond to them immediately.

E.4 MALINET Mail System

From: MAILNET 13-MAR-1985 16:53
To: M__JOHNSON
Subj: MAILNET Mail

From: @MIT-MULTICS.ARPA:OBERST@EDUCOM.MAILNET
To: M__JOHNSON@OISE.MAILNET

Received: from EDUCOM.MAILNET by MIT-MULTICS.ARPA with
Mailnet id 2656955257982260@MIT-MULTICS.ARPA ;
12 Mar 1985 14:07 est

Date: 12-MAR-1985 09:28 EST
From: OBERST @ EDUCOM.MAILNET
To: "Source-routing:" @MIT-MULTICS.ARPA:M__JOHNSON@OISE.MAILNET

Marcia,

I did get your letter, but unfortunately it has fallen to the bottom of an increasingly large pile. I think I can help with the EIES system, but would not be an expert on the other systems you asked about. I am out of the office this week, so if you don't mind, send me an electronic reminder on Monday and I will try and dig out my inbox over the weekend.

MAILNET Rejection Notice

```
From:  MAILNET   6-MAY To:  M__JOHNSON
Subj:  Successful Pickup of MAILNET Mail


Your MAILNET message to the below recipient(s) was picked up (rejected) by the HUB for
delivery.


  To:***     RECIPIENT REJECTED***       oberst@EDUCOM.MAILNET

***RCPT REJECTED***Subj:  Reminder
```

MAILNET Pickup Notice

```
From:  MAILNET        12-May-1985 14:11
To:   M___JOHNSON
Subj:   Successful Pickup of MAILNET Mail

Your MAILNET message to the below recipient(s) was picked up(/rejected)
by the HUB for delivery.

To:  oberst@EDUCOM.MAILNET

Subj:  Thanks
```

E.5 InfoGlobe News Article

** ADVERTISING WORLD **

** Telidon still a technology in search of markets **

By LAWRENCE SURTEES

840250055 WED JAN. 25, 1984 PAGE: B4
BYLINE: LAWRENCE SURTEES
CLASS: ROB
DATELINE: WORDS: 488

Telidon is still a technology seeking markets, despite continued federal Government funding, in part because the Canadian videotex industry has done little to advertise its services to the general audience, says Philip Kinsman, a spokesman for the federal Department of Communications.

Canadian Telidon terminal manufacturers have promoted their products heavily. In addition, advertising directed at potential clients has been sponsored by several of the more than 100 software and page-creation companies that prepare information to be put into Telidon* databases.*

However, there is a deficiency in addressing advertising to consumers, Mr. Kinsman said. He added that without telling prospective users what is available to them through Telidon, the untapped market will remain large.

The number of videotex terminals in Canada has reached only 5,000. This compares with estimates, when Telidon was developed, that there would be 40,000 terminals by 1983, according to a report prepared last fall by Wescom Communications Studies and Research Ltd. of Vancouver.

Infomart of Toronto - Canada's largest Telidon page-creation and support service company - advertises widely, but it addresses most of its messages to potential users of its agricultural database called Grassroots. The advertising for Grassroots, with headquarters at Infomart's Winnipeg office, comes out of the local budget. The company as a whole does not have a large budget for corporate advertising and is target-oriented to potential information providers who provide services to the user. Geared to the farming community, Grassroots provides up-to-date weather and commodities information, and is linked to the Winnipeg Commodities Exchange.

Because videotex decoders still cost more than $1,000 to buy, most of the 1,000 subscribers lease the equipment from Manitoba Telephone System. Users can receive one bill from MTS that includes the telephone charges (based on time and distance), a monthly access charge, and additional charges for the amount of information retrieved.

A spokesman at Infomart said no consumer advertising campaign is planned this year. Awareness is created primarily through media coverage of Telidon, and through provincial and federal Government advertising. The federal Government has promoted Telidon heavily, and told the general audience of its own database. Similarly, the Ontario Government has advertised its free Teleguide service.

However, a void exists in educating users and telling them of other services available. One problem is the small size of the information providers. Their capital ranges from as little as $10,000 to about $500,000, leaving little for high-cost advertising to mass audiences. An alternative would be for an industry association to meet the need. The Videotex Information Service Providers Association of Canada, which represents more than 60 companies, would be one possibility. However, VISPAC president Reginald Schoffield said the association is not involved in promotional or advertising activities and does not have plans for any.

The Canadian videotex industry has received federal Government contributions totalling $67-million over the past four years, and has raised an additional $200-million to get established.

ANNOTATED BIBLIOGRAPHY

Baath, J. A. (1982). "Experimental Research on Computer-Assisted Distance Education." In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a Distance: A World Perspective (pp. 303-305). International Council for Correspondence Education. Edmonton, Alberta: Athabasca University Press.

This paper describes experiments at the University of Lund, Sweden, wherein two different versions of the same correspondence course were offered: a traditional course with tuition by a tutor, and a computer-assisted two-way communication (CADE) system. The outcome favoured the computer-assisted system in both performance and attitudes.

Bergman, R. E. (1981). "Technology and Training: The Shape of Tomorrow's Seminar." Performance and Instruction, 20(9), 17-20.

The design, development, and delivery of tomorrow's training seminars demands a different picture of the learner-instruction relationship. Whether the technology is personal computers, teleconferencing, television, or some other combination, the designer's view will be more decentralized. Although the driving force behind this movement may be an economic one, several sound educational benefits can be realized. These include: (1) reaching learners where and when the training is needed; (2) shifting more responsibility from the trainer to the learner; (3) individualizing the studying; increasing the interaction; (4) varying the time element to meet the content demand and the learner's needs; and (5) using the learner's and trainer's time more productively.

Black, J. D., Levin, J. A., Mehan, H., & Quinn, C. N. (1983). "Real and Non-Real Time Interaction: Unraveling Multiple Threads of Discourse." Discourse Processes, 6, 59-75.

Recent analyses of discourse have focused on recurring sequential structures. An examination of discourse in different communication media has shown that strict sequentiality is not universal. Instead, discourse in some media is structured with "multiple threads". The significant property of the media producing this difference in discourse was identified as the temporal delay between turns. Discourse in "non-real time" media, such as electronic message systems, contains time-saving devices that produce multiple threads. These differences between media are discussed in light of the relative resource limitation of real time interaction and the data limitation of non-real time interaction.

Bork, A. (1985). Personal Computers for Education. New York: Harper and Row.

Despite all the talk about classroom computers, Bork believes that their importance for education really is little understood, and, in fact, that computers are being misused. Exploring the computer's role in our educational institutions, Bork divides his book into three sections.

First he considers the ways computers should be used in teaching. He discusses computer literacy and programming, asserting that BASIC should not be the first language taught, and that doing so is detrimental to the learning process. He also examines the computer as an intellectual tool and as an instructional device, and considers its role in the management of learning and LOGO.

In the second section, he covers the advantages and disadvantages of using the computer in education and the related issues of hardware and computer-based learning materials.

In the concluding section of his book, Bork looks at the long-range effect of computers on education, discussing the educational developments that will occur and the technological changes that may influence those developments.

Brochet, M. (1985, January 22-23). "Computer Conferencing as a Seminar Tool: A Case Study." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

The purpose of this article is to describe and discuss the introduction of computer conferencing to a group of graduate students in the School of Extension Education at the University of Guelph. Students used the computer conferencing system, COSY, as a seminar tool for a period of approximately ten weeks during the fall '84 semester. Conference activity was monitored during the semester via an informal case study, with a view to evaluating the progress of the group in adjusting to this new communications medium. It was also hoped that the study results would provide recommendations to other groups planning to use computer conferencing in a similar way.

Burge, E. J., Roberts, J. M., & Waldron, M. W. (1984). "Audio-Teleconferencing in Continuing Education: A Case Study With Implications". Canadian Journal of University Continuing Education, 10(2), 20-31.

This article reports on a two-day workshop designed for distance educators, using a combination of interactive media with face to face and voice to voice contacts. The planning, implementation, and evaluation stages are described in detail, concluding with comments on implications for future workshops.

Burke, R. L. (1980). "Microcomputers: The Greening of Education." Technological Horizons in Education, 7(2), 41-42.

This article describes two practical and cost-effective applications which can be achieved through microcomputer-enhanced communication in education. Applications in brainstorming and computer conferencing are described in detail.

Carmichael, G. (1980). "Computer Conferencing and the U. of A. CONFER Facility." Wayne State University Computing Services Center, Vol. 4(10).

Following an introduction outlining the impact computers are having upon communications, Carmichael describes the computer conferencing system available on MTS. A brief description of system and instructions on how to actually participate in an active conference is explained, with supporting sections on: CONFER bulletins and announcement facility; CONFER's message facility; conferencing; Advantages and disadvantages; help; application for a CONFERence; hypothetical conference topics; surcharges, rates and related information and sources.

Clement, D. (1984, September 4-7). "Empirical Guidelines and a Model for Writing Computer Documentation. In Human-Computer Interaction (2.108-2.112). London, England: International Federation for Information Processing.

Discussions of how to make computer documentation comprehensible to novices have tended to emphasize superficial aspects of the problem, such as style, amount of jargon, or "good" sentence structure. However, the problem is fundamentally one of the cognitive processes involved in text comprehension, and the specific knowledge structures tapped by a technical text. This paper describes both an empirical study of novices' difficulties in understanding computer documentation, and a model derived from it which suggests guidelines for writing more effective documentation. The author proposes a model of the computer manual comprehension task in which four processes operate simultaneously: task-mapping of the structure of regular procedures onto the structure of computer commands, constructing a mental model of the computer system, inducing the command language grammar, and learning the structure of computer procedures. Findings from the study of five novices' comprehension problems with UNIX documentation are analyzed in terms of these four processes.

Cook, W. J. (1984). The Joy of Computer Communication. New York: Dell.

Cook's handbook for private microcomputer users outlines in humourous, non-technical terms the various communication possibilities currently available. The contents include: an explanation of the hardware and software required; bulletin board systems; mail; games; shopping; banking; information systems; telecommuting; publishing; conferencing; and making social contacts. The appendix provides a lengthy list of bulletin board phone numbers.

Croft, W. B., Wolf, R., & Thompson, R. (1983). "A Network Organization Used for Document Retrieval." In J. J. Kuehn (Ed.), Research and Development in Information Retrieval (178-188). Bethesda, Maryland; Association for Computing Machinery.

A network organization for implementing a document retrieval system is proposed in this paper. The network organization has significant advantages in terms of the range of searches that can be used when compared to either inverted or clustered file organizations. Algorithms for generating and maintaining the network are described together with experiments designed to test their efficiency and effectiveness.

Cross, T. B. (1983a). "Online Training - Being There Without Going There". Computer Compacts (Netherlands), 1(4), 191-194.

The article discusses the features and advantages of computer teleconferencing. Computer or text teleconferencing is the ability to conduct an ongoing class with personnel in different geographic locations using video terminals (CRT_VDT), personal computers or computer systems. An electronic message system is used to record communications among students. Each student involved in the class can access, read, and respond to these communications, regardless of whether other participants are communicating simultaneously or not. The system thus provides a written log of the class discussion, and the asynchronous (time independent) method of participation offers great flexibility, especially if class members travel frequently or have different class schedules or are in different time zones. These features can be applied to conferences of any sort not just personnel training.

Cross, T. B. (1983b). "Computer Tele-Conferencing and Education." Educational Technology, 23(4), 29-31.

Computer conferencing is a system which enables two or more individuals at two or more locations to communicate. Without having to interrupt their work schedules and without having to pay for costly travel, these individuals can exchange information and learning aids. Through keyboard terminals, printers, and telephone lines, participants access a common central computer for extremely efficient direct communication. Many of the providers of computer conferencing offer the service via GTE Telenet or Tymshare Tymnet. The advantages of computer conferencing are best stated in terms of its extraordinary flexibility: it overcomes geographical constraints (conflicting schedules, even time zones). Computing conferencing also brings expertise to those for whom it is not otherwise available.

Cross, T. B. (1983c, October 19-21). "Learning Without Going There: Education Via Computer Tele-Conferencing." In Proceedings of the Fourth Canadian Symposium on Instructional Technology (163-172). Winnipeg, Manitoba: Associate Committee on Instructional Technology, National Research Council of Canada.

In his comprehensive coverage of tele-conferencing in education, Cross specifies four potentials: (1) improved cognitive learning; (2) improved information exchange; (3) reduced learning time, and (4) increased training effectiveness. He describes the technology available (audio, graphic, computer, full- and slow-scan video), with an emphasis on educational applications. Included in the article: a description of teleconferencing at Western Behavioral Sciences Institute, La Jolla, Cal.; continuing education advantages; teaching/learning methods; and planning, administration and cost.

Cukier, W. L. (1983, May 25-27). "Teleconferencing and Travel Substitution." Paper presented at the 33rd IEEE vehicular and technology conference meeting of the IEEE.

For the past decade, teleconferencing has been discussed as a means of reducing travel. The paper outlines the forms of teleconferencing available and the extent of travel potentially affected. A number of the factors influencing the decision to teleconference or travel at the individual and organizational level are considered including: the technology, costs, meeting requirements, user acceptance and implementation. An analysis of current usage in Ontario as a whole and in specific organizations is given. Finally, the state of the market is reviewed as teleconferencing enters its growth stage in Canada.

Da Cruz, F. & Catchings, B. (1984a). "KERMIT: A File-Transfer Protocol for Universities." Part 1: Design Considerations and Specifications. BYTE, 9(6), 255-278.

The authors cover in this article the factors that should be considered in designing a simple, reliable, inexpensive, and yet comprehensive file-transfer protocol -- KERMIT. The asynchronous serial communications used by the KERMIT protocol can accommodate a variety of diverse computer systems, and their different ways of handling information and files. KERMIT sets minimum transmission standards by providing a common subset of the machines' features. These features include transfer of the file name and contents for both textual and binary files; different error-detection methods; and time-out facilities, if either end of the communication link experiences delays or difficulties. The encoding of the information in packets, the error-detection checksums, and the layout of the fields in packets are provided.

Da Cruz, F. & Catchings, B. (1984b). "KERMIT: A File Transfer Protocol for Universities." *Part 2: States and Transitions, Heuristic Rules, and examples*. BYTE, 9(7), 143-145, 400-403.

This article provides an overview of the advanced features of KERMIT and provides a number of examples of KERMIT use. While the authors do not claim to have the "last word" on file transfer protocols, the report that implementations for over 50 computer systems now exist for KERMIT. They provide their names and addresses and invite readers to obtain information from them on various installations.

Daniels, C. E. (1984). "Online Information Retrieval: An Underutilized Educational Tool." *In Information Services & Use 4* (pp. 229-243). The Hague, Holland: Elsevier Science Publishers.

The integration of online instructions into business school curricula is advocated. A curriculum model is presented and factors including instructor training, equipment, and costs are considered. Specimen search exercises are presented.

Davie, L. & Palmer, P. (1984). "Computer-Teleconferencing for Advanced Distance Education." *Journal of University Continuing Education*, 10(2), 56-66.

This paper describes the use of computer teleconferencing for the implementation of an advanced distance education course. It begins with a discussion of conferencing, the system, and the participants, followed by the application of the design features of computer conferencing to the design of an advanced distance education course.

De Sola Pool, I. et al. (1981). "Foresight and Hindsight: The Case of the Telephone." In I. De Sola Pool (Ed.), *The Social Impact of the Telephone* (pp. 127-158). Cambridge, Massachusetts: The MIT Press.

The authors provide a number of early forecasts for use of the telephone which include some relating to long distance service; use of video; crime and the structure of cities. They classify various predictions according to whether they were concerned with technical, business, or social impact issues, and review the reasons and outcomes of these predictions. Also provided is an interesting table showing the relative references to different technologies in history of technology literature.

Dickey, E. M. (1985). "A Telecommunications Course Teaching the Uses of Microcomputers in Education." *Technological Horizons in Education Journal*, 12(8), 74-77.

The University of South Carolina is a nine-campus system consisting of a main campus in Columbia, and eight regional campuses located throughout the state. The university's College of Education wanted to help provide instruction for the state's 40,000 teachers in the use of microcomputers in the classroom. The course which has been offered since January 1983, has taught nearly 500 pre-service and inservice teachers throughout South Carolina. The purpose of the course is to provide each student with an initial experience and the knowledge needed to use a microcomputer and software in a particular discipline. Course components include a televised lecture by the instructor of the course and a hands-on session supervised by a facilitator at each regional location. The course is taught in 15 weeks, which includes 30 hours of classroom lectures and 16 hours of hands-on experience. The content of the course is considered dynamic and in need of constant evaluation and change. For example, plans are being made to incorporate more classroom management applications into the course. It is the hope of the designers that this course followed by one or more discipline-specific course will successfully provide educators with the knowledge necessary to make the microcomputer a useful tool in their work.

Dodd, W. P. (1983). "Electronic Journal Experiment: Universities Produce a Learned Journal." *Data Processing*, 25(5), 34-36.

This paper describes an experiment in producing an electronic journal. Articles are submitted by a total of 80 users over the UK PSTN network and are then refereed. Referees are able to make comments online and make them available to a limited audience. Easy access and navigation through the various facilities available on the system, (i.e., the journal and a general message facility), has been achieved by modification of a proprietary computer conferencing package.

Eldridge, J. R. (1982). "New Dimensions in Distance Learning." Training and Development Journal, 36(10), 42-44, 46-47.

The author discusses computer teleconferencing and electronic bulletin boards (EBB) and gives reasons why trainers need to understand this technology's potential in international training. An evaluation of the use of an electronic bulletin board in an undergraduate engineering course is provided. He concludes that the use of the bulletin board brought the group together in a way that would otherwise not have been possible and helped to create a "group" sense among his students.

Ellis, G. B. & Chapman, R. S. (1982). "Academic Equivalency of Credit Courses by Teleconference." In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a Distance: A World Perspective (pp. 276-278). International Council for Correspondence Education. Edmonton, Alberta: Athabasca University Press.

The quality of university credit courses is dependent upon: professor preparation; effective, ethical grading procedures; equivalence with the on-campus version of the course; access to resources (ie. library); access to instructors; and face-to-face contact with instructors. Suggestions for meeting these criteria are outlined.

Ellis, M. E. & McCreary, E. K. (1985, January 22-23). "The Structure of Message Sequences in Computer Conferences: A Comparative Case Study." Paper presented at the Computer Conferencing and Electronic Messaging Conference meeting, at the Institute of Computer Science, University of Guelph, Guelph, Ontario.

Paper presented at Guelph. When two conferences were plotted using symbols to represent speakers, contents, and direction of reference, it was possible to compare: rates of participation; degree of peer interaction; proportion of process statements; and the pattern of message linkages. Personal remarks were classified as reflections of climate, and the cognitive structure profiled to reveal message clusters. Participation, climate and cognitive structures were interpreted as indicators of conference synergy.

Elton, L. (1981, May 4-7). "Training Teachers for Distance Teaching." Paper presented at a meeting of the Regional Symposium on Distance Learning in Asia, Penang.

A case is made for the training of teachers for distance teaching. Such training should be of a general kind, suitable for all teachers in higher education, but should use distance learning methods. In this way teachers can acquire direct knowledge of what their students will experience. Such a course is described.

"Up Front with Communications." (1984, November). The Financial Post: Report on the Nation, pp. 68.

This article describes the present state of telecommunications in Canada. It states that using cable technology, to transmit non-video information to homes, will be the "new revolution" of the future. People who already have cable in place will be able to access large databases, spread sheets, or university courses and request information.

Franz, C. R. & Robey, D. (1984). "An Investigation of User-Led System Design." Rational and political perspectives. Communications of the ACM, 27(12), 1202-1209.

This article examines an application of the concept of user-led system design in an insurance company. Through longitudinal research methods, the events of the development process are described and then interpreted in two ways. One interpretation stresses the rational objectives and methods in development. The second interpretation of the same events identifies political themes. These two perspectives for project management are discussed.

Freeman, A. R. (1984, May). "The Network Nation: The Relevance of This for Possible Educational and General Public Aministrative Structures and Strategies in the 1980s and 1990s." Paper presented at the Silver Jubilee Conference of the Australian College of Education, Canberra, Australia.

In this paper, consideration is given to the interrelationships between a number of key concepts (devolution, decentralization, participation, consultation, coordination, and networking) and reports in educational and general public administration which have been produced over the last decade. Networking is the interconnecting concept.

In the first half of the thesis, emphasis is on the current relationships between the key themes and educational and general public administrative structures and strategies.

In the second half, a variation of the brainstorming technique (involving purely the author rather than a group of individuals) has been used to produce a scenario of possible educational and general public administrative structures and strategies in the 1980s and 90s; this scenario emphasizes the possible interrelationships between these structures and strategies, the key themes, and communications networks.

A case study then follows which links the key themes and the scenario by including discussion of one senior educational administrator's perceptions of probable futures for a particular education system. It is concluded that there is great potential for new technologies such as computer conferencing and data processing to assist with the restructuring of educational and general public administration. Recommendations on how this could be achieved are given. A list of descriptors and identifiers used in a computer search of ERIC for this thesis is attached.

Fullan, M. (1982). The Meaning of Educational Change. Toronto: OISE Press.

Fullan discusses the meaning and nature of change, and explains why specific attempts at change work or fail, and what would have to be done to improve our success rate. In particular, he discusses change at the local level by first considering the current situation of the participants: teachers, principals, students, district administrators, consultants, parents, and the community. He offers a comprehensive description of the plight of the teacher within the system, and the problems that must be overcome before change can occur.

Gaines, B. R. & Shaw, M. L. (1984a). "Dialogue Shell Design." In Interact '84: First IFIP Conference on Human-Computer Interaction. Amsterdam: Elsevier Science Publishers.

Many rules have been proposed for dialogue engineering effective human-computer interfaces. The underlying technology has been changing rapidly with the introduction of windows, icons, and natural languages. How coherent, complete and consistent are the various systems of rules, and how applicable they are to the new technologies? A systematic model of human protocols is needed where the principles and technology dependencies are clearly expressed. There is a need also for such protocols to be made available as application-independent processes, dialogue shells, that implement effective human protocols. This paper gives a systematic exposition of dialogue engineering, shows how these structure effective human protocols in different dialogue technologies, and how this leads to the design of dialogue shells.

Gaines, B. R. & Shaw, M. L. (1984b). "Generations of Computers: Modeling and Forecasting." Possible Worlds, 1(4), 3-16.

A model of the development of the computing industry is described, and used to account for past events and predict future trends. The industry came into being as electronic device technology enabled the social need to cope with an increasingly complex world to be satisfied. Underlying all developments in computing is a tiered succession of learning curves which make up the infrastructure of the computing industry. The paper provides a framework for the industry based on this logical progression of developments.

Geller, V. J. & Lesk, M. E. (1983). "User Interfaces to Information Systems: Choices vs Commands." In J. J. Kuehn (Ed.), Research and Development in Information Retrieval (130-135). Baltimore, Maryland: Association for Computing Machinery.

Do users prefer selection from a menu or specification of keywords to retrieve documents? The authors tried two experiments, one using an on-line library catalogue and the other an on-line news wire.

In the first, library users could either issue keyword commands to see book catalog entries, or choose categories from a menu following the Dewey Decimal classification of the books. In the second, news wire users could read Associated Press news stories either by posting a keyword profile against which all stories were matched, or by selecting them from a menu of current news items.

For the library users, keyword searches were clearly preferred, by votes of 3 and 4 to 1; for the news stories, retrieval by keyword search is 50% less common than menu choice. The authors suggest that the difference is based on the degree of user foreknowledge of the database and its organization. Menu-type interfaces tell the user what is available. If the user already knows, as in the library where a majority of the users have a particular book in mind, then the menu is merely time-consuming. However, when the user does not know what is available (almost the definition of "news" is that it is new, and unpredictable), the menu is valuable because it displays the choice.

Gengle, D. (1984). *The Netweaver's Sourcebook: A Guide to Micro Networking and Communications*. Reading, Mass.: Addison-Wesley.

The author offers this book as a guide to the new possibilities inherent in the Information Age. He examines micro communications as part of the Information Age, how micro communications deal with profound social, professional and interpersonal changes, and the technical as well as human concerns of using micro communications in the home or office.

Gerber, C. (1983). "Networks: Personal Links in the Electronic Universe." *Online Today*, pp. 12 -17.

Gerber provides an overview of the kinds of interaction currently occuring over computer networks, including conferencing, bulletin boards, and making social contacts.

Gillies, D. J. (1983, October 19-21). "Videotex and Teletext: Teaching and Learning An International Survey." *In Proceedings of the Fourth Canadian Symposium on Instructional Technology* (187-196). Winnipeg, Canada: Associate Committee on Instructional Technology, National Research Council of Canada.

D. Gillies is with the film and photography department, Ryerson Polytechnical Institute, Toronto. He has researched videotex and teletext in Canada, Britain, France, Germany and the United States, 1979 - 83, and is a member of an information provider group in the Bell Canada "Vista" Telidon field trial in Ontario and Quebec. From this perspective, the paper assesses the theoretical potential of videotex and teletext for teaching and learning, and surveys some of their international applications in the broad field of education.

Glossbrenner, A. (1983). *The Complete Handbook of Personal Computer Communications: Everything You Need to Go Online with the World*. New York: St. Martin's Press.

This is a handbook for new computer users. It provides advice on how to send electronic letters, access online databases, shop online, buy modems and communications software, and how to download a variety of computer software. It also presents ideas on the role of communications in the workplace as a means of reducing or eliminating commuting.

Goetz, J. P. & LeCompte, M. D. (1984). *Ethnography and Qualitative Design in Educational Research*. Orlando, Florida: Academic Press.

This book describes many of the problems of conducting ethnographic research. It addresses questions such as the way data are collected, methods for assuring the quality of data, and techniques for organizing results, conclusions, and interpretations. The book was written to communicate with the general community of social science researchers, in an effort to contribute to dialogue examining the premises and assumptions of scholarly activity, the values and social policy informing social research, and the relationships and interdependencies of scientific endeavour with the broader human enterprise.

Good, M. D., Whiteside, J., & Wixon, D. (1984). "Building a User-Derived Interface." *Communications of the ACM*, 27(1), 1032-1043.

Many human-computer interfaces are designed with the assumption that the users must adapt to the system, and that users must be trained and their behaviour altered to fit a given interface. The research presented here proceeds from the alternative assumption: Novice behaviour is inherently sensible, and the computer system can be made to adapt to it. Specifically, a measurably easy-to-use interface was built to accommodate the actual behaviour of novice users.

Novices attempted an electronic mail task using a command-line interface containing no help, no menus, no documentation, and no instruction. A hidden operator intercepted commands when necessary, creating the illusion of an interactive session. The software was repeatedly revised to recognize users' new commands; in essence, the interface was derived from user behavior. The first version of the software could recognize only 7% of Ss spontaneously generated commands; final version: 76% (Ss = 67).

This experience contradicts the idea that user input is irrelevant to the design of command languages. Through careful observation and analysis of user behavior, a mail interface unusable by novices evolved into one that let novices do useful work within minutes.

Guillaume, J. (1980). Computer Conferencing and the Development of an Electronic Journal. The Canadian Journal of Information Science, 5 (May), 21-30.

The electronic information exchange system at the New Jersey Institute of Technology provided the medium to construct an on-line electronic journal equivalent to the standard print journal. In an electronic journal, all facets of the information exchange process would be directly accessible on-line, from problem delineation, discussion, authorship, submission, editing and refereeing, to full text transmission, storage, and retrieval. This paper presents the findings from an evaluation and analysis of information usage patterns, group processes, and patterns of social and behavioural interaction.

Harasim, L. & Johnson, E. M. (1985, January 22-23). Educational Applications of Computer Conferencing for Teachers in Ontario. Paper presented at the Workshop of Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

This paper reported some preliminary results of an on-going project to investigate the potential of computer networks and conferencing systems for the delivery of distance education and professional development programs to teachers in Ontario. The focus in the paper was on one aspect of the larger study: how to employ computer conferencing applications for the adult learner. An overview of the potential of computer conferencing for distance education was provided along with a number of recommendations for designing distance education using conferencing and electronic mail.

Hiltz, S. R. (1978). "The Computer Conference" Journal of Communication, 28(3), 157-163.

This paper describes computerized conferencing comparing selected characteristics to those of other group communication media. Results of field trials and laboratory experiments are offered to demonstrate positive comparisons to audio and visual conferences. The author believes that computerized conferencing seems competitive with audio or audio-visual conferencing for tasks such as giving and receiving information, exchanging opinions, and generating ideas. Since these tasks are central to the scientific and technical communities, and since the conferencing is cheaper and more convenient than other media, she concludes that it would be preferable for these functions.

Hiltz, S. R. (1984). Online Communities: A Case Study of the Office of the Future. Norwood, New Jersey: Ablex.

Hiltz focuses on the applications and social impacts of computer-mediated communications systems and their designs and evaluation, including managers who must decide whether to implement such systems. Topics include: the reactions of personnel to spending much of their time online; willingness or resistance to incorporating a computer-mediated communication system into their daily lives; and the impact of the system on organization and productivity. She also looks at the relationship between technological innovation and social change.

Hiltz, S. R. & Turoff, M. (1978). The Network Nation: Human Communication Via Computer. London, England: Addison-Wesley.

This book examines how inexpensive computer power and communications links will, over the next few years, facilitate the emergence of vast communication and information networks. According to the authors, the Network Nation is a society in which telecommunication via computer networks has diminished time and distance barriers among people, and between people and information to near zero. In order to explain the nature and consequences of the emerging Network Nation, the authors review the history of computer conferencing systems, discuss what is known about the social and psychological impacts of this new form of communication, look at the potential applications to a wide range of societal processes, and review the present and future technical and policy issues related to such applications.

Hiltz, S. R. & Turoff, M. (1981). "The Evolution of User Behaviour in a Computerized Conferencing System." Communications of ACM, 24(11), 737-751.

Data from 18-month operational trials of the EIES system indicate that the range of features considered valuable in a computer-based communication system increases with the amount of experience gained by using this medium of communication. Simple message systems alone are not likely to satisfy the communications needs of long term, regular users of computerized communications systems. Among the capabilities which long term, regular users find valuable are group conferences, notebooks for text composition, and self-defined commands.

Hiltz, S.R., Turoff, M., & Johnson, K. (1981). The Effect of Structure, Task, and Individual Attributes on Consensus in Computerized Conferences. In R. P. Uhlig (Ed.), Computer Message System (pp. 91-102). The Hague, Holland: North Holland Publishing Company.

One criterion of the effectiveness of a computer-mediated communication system for group decision-making is the ability of the group to agree on any decision. This paper presents data from two controlled experiments designed to answer several questions including: (1) How does a computerized conference differ from a face-to-face discussion in terms of the ability of a group to reach consensus? (2) How is this affected by the nature of the task? (3) How is it affected by the skills and characteristics of the participants, such as their previous use of computer terminals and their typing ability? (4) How is it affected by the specific structure used for the computer-mediated communication system? Specifically, can an explicitly structured human leadership role aid consensus in a computerized conference? Can a decision aid based on computer analysis and feedback of data related to the decision help? (5) What are the implications of the findings for the design and application of computer-mediated communication systems?

Hooper, R. (1983). "The Computer as a Medium for Distance Education." In J. Megarry, D. Walker, S. Nisbet, & E. Hoyle (Eds.), World Yearbook of Education (pp. 103-108). London, England: Kogan Page Ltd.

Communications technology can be applied to distance education in two ways: (1) In live/transmitted mode, the student learns "on-line" from material transmitted over a distance in real-time (eg. TV broadcast); and (2) In recorded/local mode, the learner receives material (eg. cassettes or disks) for use "off-line" whenever convenient.

Three types of live/transmitted computer-assisted distance learning approaches are described: 2-way CAL (eg. Prestel), 1-way information retrieval (eg. teletext), and computer-assisted live teaching (eg. CYCLOPS). Recorded/local modes of learning have been advanced by the rise of portable learning devices and personal computers. Telesoftware is put forward as a response to the problem of software distribution. It combines the advantages of both modes of distance learning by computer.

Hudson, H. E. & Boyd, C. H. (1984, March). Distance Learning: A Review for Educators (Tech. Rep.). Washington, D.C.: Southwest Educational Development Lab.

Designed to provide an overview for educators, this report summarized experiences to date with applications of communications and computer technology to distance education. Findings relevant to educators concerned with grades K-12 in the six-state region of Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, and Texas are emphasized. A brief overview of the potential distance education technologies describes computer communications which include electronic mail, computer conferencing, and computer-assisted instruction. Important factors in evaluating distance learning projects are examined including: student performance; performance of hardware and software; capital, start-up and operating costs; level of complexity of software development; attitudes of teachers, learners and project staff; and the relationship of project goals to institutional goals.

James, J. S. (1981). The Conference Tree: Computer Conferencing on Personal Computers. Dr. Dobb's Journal, 6(10), 14-15.

Computer conferencing allows group meetings which are non-simultaneous in both time and place. A typical conference may run 24 hours a day and last for months, with individuals interacting at their convenience, using a terminal and the telephone. The conference tree, a system now available on the APPLE allows such meetings on a small computer. It is a hierarchical (tree-structured) database of messages, designed to be accessed by telephone, with categories and subcategories determined entirely by the user.

Johansen, R. & DeGrasse, R. (1979). "Computer-Based Teleconferencing: Effects on Working Patterns." Journal of Communication, 29(3), 30-41.

This paper summarizes conclusions of a report to determine whether computer conferencing improves productivity of geographically separated researchers. It examines how computer conferencing affected whom, when, and where. It also discusses how conferencing altered the ways in which people work.

Johansen, R., McNulty, M., & McNeal, B. (1978). "Electronic Education: Using Teleconferencing in Post-Secondary Organizations." Institute for the Future, Report R-2.

The focus of this study is the current and potential uses of teleconferencing media in post-secondary education. In addition to instruction and training, post-secondary issues include the administrative and organizational processes that are complementary to teaching and learning. Teleconferencing includes audio, video, computer-based and media mixes. The project begins with the identification and subsequent data gathering of 75 organizations who had direct experience with teleconferencing. From the data, 13 systems that could be viewed as prototypes were identified and studied. This report should be of particular interest to those considering implementation of teleconferencing media, through its provision of a basis for informed judgement regarding the strengths and weaknesses of teleconferencing, and its guidelines for effective future use of these media in post-secondary education.

Johansen, R., Vallee, J., & Collins, K. (1977, September 5-8). "Learning the Limits of Teleconferencing: Design of a Teleconferencing Tutorial." Paper presented at a meeting of the NATO Science Symposium on the Evaluation and Planning of Telecommunications Systems.

This paper begins with a summary of the communication potentials and pitfalls of teleconferencing, with the exclusion of affective qualities of communication and anxiety in the learning stages, discussed in more detail. Subsequently, five learning-related variables emerge: personal communication style (and history) of the participants, group tasks to be performed, group structure and leadership, sense of social presence, and teleconference arrangements. Each variable is discussed.

Johnson, E. M. (1983). "Design Considerations for a Database Management System for Ontario Education. Unpublished master's thesis, University of Toronto, Toronto, Ontario.

The main purpose of this thesis was to develop an architectural groundwork for an Ontario education database management system, to provide a central source of information on the people, their interests, and work being undertaken in the area of computers in education. The database would be used for fostering and promoting closer intercollegial contacts, for facilitating cross-disciplinary knowledge exchange, and for locating expertise for research grant proposal reviews, conferences and journal article referees.

The design process for the study proceeded through a number of stages. These included the analysis of user requirements and a detailed examination of the education and information retrieval environments, by employing a cyclical process of interviews and question refinement. The summarization of the material gathered from these many sources was used to discuss how user needs, and knowledge of the larger environment, would affect the design of the database management system. The summarization led to a series of recommendations to aid people involved in the design of database management systems in education.

Kaufman, D. (1984). "A Computer-Based Instructional System for Distance Education." *Computer Education*, 8(4), 479-484.

This paper argues that the educational technologies of distance learning systems and telematics will be merged, leading to computer-based distance education systems. These systems will far surpass our current computer-augmented systems in which the computer is used simply as a support tool, and does not really overcome the major problems of learning at a distance. The conclusion reached is that computers will revolutionize the educational and social dimensions of distance education practice, with consequent effects on traditional educational systems.

Keisler, S., Siegel, J., & McGuire, T. (1983). Social Psychological Aspects of Computer-Mediated Communication." *American Psychologist*, 39(10), 1123-1134.

The article describes some of the current issues in computer-mediated communication, and focuses on how people participate, the effects on group efforts to reach consensus, differences in participation, interaction, and decisions between face-to-face and computer-linked discourse.

Kerr, E. & Hiltz, S. R. (1982). *Computer-Mediated Communication Systems*. New York: Academic Press.

This work presents the systematic findings of a panel of experts who designed and evaluated computer mediated communication systems. The authors used a modified "delphi" technique to create a framework for reporting and comparing the results of 18 projects related to computer technology. The resulting state-of-the-art synthesis covers current knowledge about computer conferencing, electronic mail, and office information communication systems. The book emphasizes aspects of computer mediated communication systems such as: software design considerations; factors that determine the acceptance or rejection of systems; impacts of system on the individuals, groups, and organizations that use them; and evaluation strategies to provide users feedback for implementation strategies.

Knapper, C. & Waslycia-Coe, M. (1982). "Characteristics and Attitudes of Correspondence Students." In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), *Learning at a Distance: A World Perspective*. Edmonton: Athabasca University Press.

Knowles, M. (1970). *The Modern Practice of Adult Education*. New York: Association Press.

Knowles offers a comprehensive review of adult education theory and practice. He introduces the concept of "andragogy," as opposed to pedagogy with respect to adult learners. Andragogy is premised on four assumptions about adult learners that differ from the assumptions about child learners on which traditional pedagogy is premised. These assumptions are that, as a person matures, 1) his/her self-concept moves from being dependent to self-directing; 2) he/she accumulates experience that becomes an increasing resource for learning; 3) his/her readiness to learn becomes oriented increasingly to the developmental tasks of her social role; and 4) his/her time perspective changes from future to present applications of learning.

Knowles, M. (1975). *Self-Directed Learning: A Guide for Learners and Teachers*. Chicago, Illinois: Follett Publishing Company.

Knowles, one of the leading authorities in the field of adult education, argues the benefits of self-directed learning, and sets out a guide for both learners and teachers. He distinguishes between self-directed and teacher-directed learning as two fundamental approaches in adult education, and through a set of inquiry projects guides the learner through the self-directed approach. The book is divided into three sections: (1) for the learner; (2) for the teacher; and (3) resources for self-directed learning.

Koning, S. M. (1981, October 11-14). "Computer Conference and Message Systems: Their Use in a University Computer Center." Paper presented at the ACM-SIGUCC User Services Conference IX meeting of the The Association for Computing Machinery -- Special Interest Group for University Computing Centers.

CONFER, a computer conference and message system, is used for communication with users, among computer center staff members and with staff members from other computer installations. Characteristics of the organization which make it advantageous to use the computer as a medium of communication and the specific applications of the computer center are discussed. The strengths and weaknesses of computerized communication are also considered.

Kurland, N. D. (1983). "Have Computer, Will Not Travel: Meeting Electronically." Phi Delta Kappan, 65(2), 124-126.

Beginning with two different scenarios depicting a face-to-face conference on the one hand and, on the other, a computer or electronic conference, the author argues the advantages of electronic conferencing and describes some of its uses. He believes that a good curriculum for the 1990s will be one that, among other things, will help learners understand the nature of an era of value conflicts. Educators must understand that the nature of the world of tomorrow cannot be forecast with precision; what tomorrow brings will depend on where our insightful, humane values -- or their absence -- will lead us as we move into the future of the information society.

Lampikoski, K. (1982). "Towards the Integrated Use of the Computer in Distance Education." In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a Distance: A World Perspective (pp. 296 - 298). International Council for Correspondence Education. Edmonton, Alberta: Athabasca University Press.

The article indicates some of the functions which can be handled by computers in distance education.

Lederberg, J. (1978). "Digital Communications and the Conduct of Science: The New Literacy." Proceedings of the IEEE, 66(11), 1314-1319.

This essay is a personal perspective on the emergence of a new form of communication, optimistically called the "EUGRAM". This form is based on the convergence of economical digital communications with computer-aided facilities for file management, and protocols to facilitate the interconnection of users separated both in time and space. The EUGRAM is contrasted with the telephone, with the latter's demands on instant availability and the subjugation of the user to an almost uninterruptible stream of data. The EUGRAM is expected to increase the thoughtfulness of communication, the return of literacy in the efficient and precise use of language, and to enhance scientific discourse in many ways.

Lerch, I. A. (1983). "The Movable Conference." BYTE, 8(1), 104-120.

Computer moderated conferencing is a revolutionary new communication medium, which is set to change the structure of the executive business meeting. The most apparent difference between computer-moderated conferences and face-to-face meetings is in the temporal relationship of the exchanges. In a computer conference, messages are forwarded in time, day or night. Because each participant needs only a normal telephone line, or leased communications line, to connect a terminal to a central host computer, the interchange is independent of place as well as time.

Levinson, C. (1985). "Education by Telecommunications at the Elementary and Secondary Level: Practices and Problems." Technological Horizons in Education Journal, 12(8), 71-73.

This article reviews several projects including CONNECT* ED (Arkansas), Penn Link (Pennsylvania), and the computer chronicles (linking Alaska and California). It describes the mixes of equipment used by the various projects and considers a number of questions relevant to the establishment and use of networks and microcomputers in education. These include; the problems of courses being taught in one state by an instructor from another; the effect on a school if its courses become increasingly offered online; and how funding can be allotted to this type of distance learning. She also considers the skills needed by teachers and the cost effectiveness of electronic distance learning.

Lucas, H. (1975). Why Information Systems Fail. New York: Columbia University Press.

The design and operation of information systems have long been considered primarily technical activities. While there are still technical problems to solve, there is adequate technology to develop sophisticated information systems. But due to the concern about technology, the fact that almost all information systems exist within an organizational context is frequently ignored. The purpose of this book is to present a descriptive model of information systems, in the context of the organization, and to test the model with empirical data from six studies. The studies, conducted by the author, involved 2,000 users in 16 organizations. The model and studies are focus on organizational behavioural variables in information system activities, because they have received so little attention in the literature.

Madden, J. C. (1982). "Distance Education and the Information Revolution." In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a Distance: A World Perspective (pp. 268-270). International Council for Correspondence Education. Edmonton, Alberta: Athabasca University Press.

This paper discusses how the "information revolution," touched off by microelectronics, will affect distance education, by moving it from one-way (broadcasting) to 2-way (interactive) tutoring. The article identifies "7" properties of a good program: suitability, quality, understanding, availability, responsiveness, depth, and low cost.

Magers, C. S. (1983, December 12-15). "An Experimental Evaluation of On-Line HELP for Non-Programmers." In A. Janda (Ed.), Human Factors in Computing Systems (277-281). Baltimore, MD: Association for Computing Machinery.

An interactive computer system was made easier to learn, for non-programmers by modifying the on-line HELP and error messages of a system designed primarily for programmers. The modifications included supplementing the existing HELP command with a HELP key, making the content of HELP and error messages more concrete, responding to command synonyms, and more.

The systems were evaluated in a between-groups experiment in which office workers with no programming experience were asked to perform a typical office task using one of the unfamiliar interactive computer systems. The results of the experiment supported the inclusion of the modifications. Non-programmers using the modified system completed the computer task in less time, with greater accuracy, and with better resulting attitudes than those who used the system designed primarily for programmers.

Marshall, C. R. (1984, September 4-7). System ABC: "A Case Study in the Design and Evaluation of a Human-Computer Dialogue." In Human-Computer Interaction (1.419-1.423). London, England: International Federation for Information Processing.

Human factors specialists concerned with the human-computer interface live in two worlds. In the world of theory they are concerned with the properties of the ideal interface -- one that is easy to learn and use, and results in performance that is efficient and error-free. In the world of practice we must design working systems in the presence of many constraints. This paper presents a case study in the design and evaluation of a human-computer dialogue in a constrained environment. It also discusses the relationship between theory and practice in interface design, with particular emphasis on the role of standards and guidelines. The author concludes that since design guidelines and standards play an important role in bridging the gap between theory and practice, it is crucial that they be as correct, complete, and usable as possible. For this reason, guidelines and standards should be subjected to empirical evaluation and the test of "practice" whenever possible.

Mason, R. E. A. (1985, January 22-23). "On What the User Expects." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

Users of any new computing facility often expect more than the facility is designed to provide, according to Mason. His paper classifies users, and discusses this problem of user expectation in terms of user type, in the context of computer conferencing systems. The paper also discusses the relation between such systems and other office-type applications.

Masterton, P. (1984). "A Futurist Looks at EdTech; Or Wheel-Reinventing Reconsidered." Technological Horizons in Education, 11(4), 143-146.

The author states that in every walk of life we are faced with technological options that could revolutionize our everyday activities. We have new tools whose potential uses have only barely begun to be tapped, and whose potential depends on the imagination and ingenuity of the user. She believes that only through creative new uses of the computer can we move beyond using educational technology to force information into people's heads, or just to transport them from one grade level or course to another. Imagination and ingenuity can help us reinvent not only our technology, but the future itself.

Maude, T. I., et. al. (1984, September 4-7). "An Experiment in Group Working on Mailbox Systems." In *Human-Computer Interaction* (1.396-1.400). London, England: International Federation for Information Processing.

A computer conference on the subject of electronic mailbox systems was held over the BLEND system in 1983. After nine months the ideas generated had been developed, written up, and submitted to an international meeting as a paper, entirely by means of the computer conferencing system. The work that was done to prepare that paper, the roles and structures adopted, and the patterns of communication between the mailbox members are described. Comparisons between mailbox and face-to-face working are made, and some of the strengths and weaknesses of mailbox group working are identified. The paper, which has itself been written using the BLEND mailbox system, concludes that mailbox systems can be used successfully by groups of otherwise unrelated people to produce work jointly, and within a previously defined timescale.

Mayer, A. (1985, January 22-23). "User Friendliness at 300 Baud (the COSY Approach to the Human Interface)." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

The COSY conference system was developed with ambitious design goals and a number of constraints, vis-a-vis the "user interface". Among these, were that it be learnable without recourse to a manual, and that it be "friendly" even over low-speed phone lines. The user interface, according to Mayer, can make or break the success of such a system, no matter how powerful the underlying system architecture. This paper looks at the goals and constraints, and discusses how they were responded to in COSY.

McConnell, D. & Sharples, M. (1983). "Distance Teaching by CYCLOPS: An Educational Evaluation of the Open University's Telewriting System." *British Journal of Educational Technology*, 14(2), 109-126.

As a supplement to telephone tutoring, the Open University has developed a graphics telewriting terminal called "CYCLOPS", which allows for the live transmission of writing and drawing by telephone. The system is described, including its use in a 2-year trial project for tutoring students. Preliminary findings from formative evaluations are discussed, with suggestions for setting up similar systems. Telewriting tutorials are educationally effective and acceptable to a large number of students and tutors.

Meierhenry, W. C. (1982). "Microcomputers and Adult Education." In D. G. Gueulette (Ed.), *Microcomputers for Adult Learning: Potentials and Perils* (pp. 11-27). Chicago, Illinois: Follett Publishing Company.

Meierhenry examines the potential of microcomputers for enriching and improving adult education. The article describes some of the factors that will facilitate or retard use of microcomputers, some of the theoretical problems that will have to be faced, and some of the possible applications of the microcomputer in adult education.

Miles, M. and Huberman, A. M. . (1984). *"Qualitative Data Analysis: A Sourcebook of New Methods*. Beverly Hills, California: Sage Publications.

This book was written to address a critical need faced by researchers in all fields of the human sciences. How can valid meaning be drawn from qualitative data, and what methods of analysis can be employed that are practical, communicable, and non-self deluding? The book describes why the authors believe this problem is now critical, and describe their stance towards matters of qualitative analysis. Included are chapters on focusing and bounding the collection of data; analysis during data collection; within-site analysis; cross-site analysis; and how to draw and verify conclusions. The book is intended to be a practical guide that offers variations, and advice for qualitative researchers.

Mozes, G. (1982). "Professional Education and the Microcomputer." In D. Gueulette (Ed.), Microcomputers for Adult Learning: Potentials and Perils. Chicago: Follett Publishing.

The first part of this article presents a short examination of adult learning, from the vantage point of the microcomputer. This is followed by a case study of the work done at Michael Reese Hospital in Chicago in developing computer simulations for practicing physicians.

The second part presents a review of microcomputer applications from different parts of the country. The objective of the article is to provide information on how the microcomputer is used in professional education today, and to offer a few suggestions regarding its future use.

Naisbitt, J. (1982). Megatrends. New York: Warner Books.

Naisbitt analyses the recent future. He places much of the responsibility for recent and future change on the development of our sophisticated technology, which has initiated the transition from an industrial society to an information society.

Chapter 8, "From Hierarchies to Networking," describes the redistribution of power and information as the flexibility of technology undermines the rigidity of hierarchical systems. Although hierarchies remain, our belief in their value does not. Consequently, people have moved outside the structure, forming networks of communication. Central to the networking system is the computer, which has allowed people to make personal contact in lieu of the lock-step communication route enforced by the business or political hierarchies. He describes the structure and potential of networks, knowledge networking, and its decentralizing effect on business.

Nashif, A. M. (1982). "Distance Education for the In-Service Training of Teachers." In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a Distance: A World Perspective. International Council for Correspondence Education. Edmonton, Alberta: Athabasca University Press.

The distance education program described was a response to the problems inherent in traditional teacher in-service programs (ie. expensive, time-consuming, disruptive of classroom routines). The program described included: face-to-face teaching; ensured full integration of the various components of the multi-media approach; included communication media as an integral part of the teacher training curriculum; made extensive use of individualized and task-oriented instructional materials; and relied heavily on evaluation and feedback for the continuous improvement of instructional material.

Newell, A. & Sproull, R. F. (1982). "Computer Networks: Prospects for Scientists. Science, 215(4534), 843-852.

Computer networks are an integral part of the rapid expansion of computing. Their emergence depends both on evolving communication technologies, such as packet-switching and satellites, and on diverse experiments and innovations in the software tools that exploit communications. The tools provide computer users with facilities such as electronic mail, access to remote computers, and electronic bulletin boards. Scientists can both adapt and extend tools to meet the communication needs of their work, and several networks are developing to serve particular scientific communities.

Nichols, E. A., Nichols, J. C., & Musson, K. R. (1982). Data Communications for Microcomputers with Practical Applications and Experiments. New York: McGraw-Hill.

Owners of microcomputers must often bear most of the responsibility for maintaining and enhancing their own systems. This book provides explanations of the basic principles of data communications, and offers practical guidance for implementing the hardware and software necessary to handle common problems arising in a microcomputer-based environment. Particular attention is given to locating and solving problems associated with communications between CPUs, terminals, and printers, as well as how to access and use public packet-switched telephone networks.

O'Malley, C. et al. (1983, December 12-15). "A Proposal for User-Centered System Documentation." In A. Janda (Ed.), Human Factors in Computing Systems (282-285). Baltimore, MD: Association for Computing Machinery.

This paper outlines a set of proposals for the development of system documentation based on an analysis of user needs. It is suggested that existing documentation is not sensitive enough to the variety of levels of user expertise, nor to the variety of contexts in which online help is required. The authors outline three specific proposals for fulfilling these needs: (1) a quick reference facility; (2) a command-line database, and (3) a facility for full explanation and instruction, and suggesting a number of ways in which users might access these facilities. Finally, they suggest a way of combining these facilities into an integrated structured manual, offering more effective user support than is currently provided.

Ontario Teachers' Federation (OTF/FEO). (1981, June). Ontario Curriculum 1981. A project of the Educational Studies Committee of the OTF, 1260 Bay Street, Toronto, Ontario M5R 2B5: An evaluation of curriculum development policy and practice and professional development policy and practice.

Palme, J. (1982). "Experience with the Use of COM Computerized Conferencing System." Software World (GB), 13(3), 2-11.

The following subjects are discussed: computer conferencing, the "COM" system, history and legal problems, some statistics on the usage of COM, organizational distance between users, cost of using COM, cost per user hour, time for using COM, cost comparisons with other media, personal information in the COM system, an American group dynamic comparison between face-to-face meetings and computer conferencing, and opinions about COM among users and nonusers.

Palme, J. (1984, September 4-7). "Survey of Computer-Based Message Systems." In Human-Computer Interaction (1.263-1.269). London, England: International Federation on Information Processing.

This paper provides a survey of computer-based mail and conference systems. The paper discusses systems for individually addressed mail and group addressing, through conferences and distribution lists. Various methods of structuring the test database in existing systems is discussed, and networks of interconnected systems (ARPANET, CSNET, BITNET, USENET, JNT-MAIL, EURNET, MAILNET, etc.) are described. The emerging standards for the interconnection of messages systems are described.

Patterson, H. F., & Anderson, A. (1983). "Integrating Changing Communication Technology into Business Communication Classes." Journal of Business Education, 59(1), 8-11.

The authors state that the art of business communication is changing, as new modes of communication are made available through technological advancements. They believe that it is highly relevant that the curriculum in business communication courses should reflect these changes. While they stress that the importance of traditional forms of written and oral communication should not be diminished, an understanding of communications technology is critical. They review such features as telecommunications including computer and video teleconferencing, computer graphics, fiber optics, electronic mail, and voice recognition. Included in the article is a list of suggested topics for students to undertake.

Pollard, J. & Holznagel, D. (1984, March). Electronic Mail (Tech. Rep.). Portland, Oregon: Northwest Regional Educational Lab.

Decision makers must address the issues of (1) just what are electronic communications? (2) how will they help me teach, administer, or survive? and (3) what will it cost in time and money? Electronic mail allows the sending of letters, memos, and messages to anyone who uses the same electronic mail system, and provides most of the options that are available through the traditional post office, including registered, bulk, and express mail. Perhaps the greatest advantage of electronic mail, however, is the informal, telegraphic writing style that is customary. Other forms of electronic communication include electronic bulletin boards and computer conferences. Hooking up with an electronic mail system requires equipment (a microcomputer or terminal, modem, interface, and cable); software (a smart or dumb terminal); and an electronic mail system with which to connect. System options include The Source, SpecialNet, Compuserve, DIALCom, and local networks. Each electronic mail system charges for membership, amount of time spent in using the system, and telephone line rental. The best bet for deciding on which electronic mail system to use is to find one used by colleagues.

Pullinger, D. J., Shackel, B., Dodd, W. P., & Maude, T. I. (1984, September 4-7). "User Surveys in the BLEND-LINC "Electronic Journal Project." In Human-Computer Interaction (1.332-1.337). London, England: International Federation for Information Processing.

This paper describes two telephone surveys of users in the 4-year experimental programme on electronic communication, organized jointly by two Universities as the Birmingham and Loughborough Electronic Network Development (BLEND). Several communities of users were studied, and this reports the first community of initially about 50 scientists (the Loughborough Information Network Community - LINC). Considerable problems were experienced with the hardware available to LINC members, with communications equipment, with modifying and developing software to obtain an acceptable operating system, and with various unexpected bureaucratic and organizational difficulties. Nevertheless, more than 50 papers are in the system, and successful teleconferences have been held.

Quinn, C. N. et al. (1983). "Real Education in Non-Real Time: The Use of Electronic Message Systems for Instruction." Instructional Science, 11(4), 313-327.

Education in different communication media takes place with functional differences that have consequences for the course of instructional interaction. In this paper, the authors examine instructional interaction among people using a computer-based electronic message system, contrasting it with conventional face-to-face discussion in a college level class. Interaction via the non-real time message contained multiple "threads of discourse", a higher proportion of student turns to teacher turns, and other deviations from the "initiation-response-evaluation" sequences usually found in face-to-face classroom interactions. Based on the results of their contrasts, they describe ways to organize instruction by using electronic message systems to take advantage of new properties, and to avoid shortcomings of these new instructional media.

Ragsdale, R. G. (1982). Computers in the Schools: A Guide for Planning. Toronto: OISE Press.

This book was written for an intended audience of people who have already acquired some knowledge and/or interest about computers; hence there is no attempt to introduce computers or computer concepts. The book is also written from the subjective view of the author and it is "his" opinions which are presented. The first four chapters provide a basis for discussion by providing a general overview of the rationale for using computers, and detailed descriptions of how computers are used in instructional settings. There are also chapters on how the use of computers is likely to affect elementary and secondary teachers, and a description of how administrative functions might be connected to the instructional setting. Equipment and its implications, software and its implications, and evaluation are included. The book summarizes the various points of view, and provides suggestions as to where educators should begin efforts to maximize the advantages computers can offer while minimizing the possible disadvantages.

Randall, L. S. (1982, September 20-23). Shared graphic workspace: Interactive data sharing in a teleconference environment. In Decisions and Designs Inc. (Ed.), Proceedings of Computer Networks Compcon 82. 25th IEEE Computer Society International Conference. (535-542). Washington, D. C. : IEEE.

The shared graphic workspace (SGWS), a medium for interactive data sharing in a teleconferencing environment, is described. The SGWS is a digital imaging system which permits participants, at different geographical locations, to view and to interact with images of documents, objects, briefing charts, or other graphic information. Images can originate from any video medium, such as a video camera, or they can be created dynamically. Communications occur over low bandwidth channels. The SGWS allows users to interactively point to features of an image, annotate an image with coloured "inks", and erase. Users can point, draw, and erase by dragging a finger across the touch-sensitive face of the video monitor, or by using a stylus on a digital tablet. Images can be saved for later review or further annotation.

Reisner, P. (1981). "Human Factors Studies of Database Query Languages: A Survey and Assessment." *Computing Surveys*, 13(1), 13-31.

Empirical studies have been undertaken to measure the ease-of-use of a query language, compare two or more such languages for use, study controversial issues language design, and provide feedback to designers for improving a language. Some primitive attempts at constructing abstract models to query languages also exist. This paper discusses some of the techniques that have been used and results obtained. A primary goal is to show the reader, unfamiliar with behavioural research, what the results do and do not mean.

Rice, R. E. & Borgman, C. L. (1983). "The Use of Computer-Monitored Data in Information Science and Communication Research." *Journal of the American Society for Information Science*, 34(4), 247-256.

As computer-based information retrieval and communication systems become more commonplace, researchers have a greater opportunity to evaluate the uses and impacts of these new technologies. The systems and the kinds of data now available are discussed along with the advantages and disadvantages of using computer-monitored data. However, the extraction and management of such data may be difficult, and they urge researchers to devise ways to integrate data collection and summary reporting into computer-based communication systems, as a natural function of system operation. They conclude with some prospects for future research, including the question of whether, and under what conditions, groups engage in similar processes when using computer-based communication systems.

Riel, M. (1983). "Education and Ecstasy: Computer Chronicles of Students Writing Together." *The Quarterly Newsletter of the Laboratory of Comparative Human Cognition*, 5(3), 59-67.

This article describes a project in which students in California and Alaska exchanged information with each other via computer conferencing. Some students used "The Source," while other students mailed "letters" to each other on computer diskettes. There is an ongoing student newspaper from the project, and students from around the United States can either leave their articles on The Source or send items via regular mail (on diskette) to student editors.

Samuelson, K., Borko, H., & Amey, G. X. (1977). "Information Systems and Networks." Amsterdam, Holland: North-Holland Publishing Company.

The study was funded by UNESCO and carried out by the researchers from Sweden, Canada, and the U.S.A. Its purpose was to present practical guidelines of informatics for the planning, design and management of general systems for processing, storage, retrieval, and dissemination of information and knowledge. The book is also intended as an advisory tool, and for education and training in developing countries.

Schroeder, R. E. (1981). "Computer Conferencing: Exploding the Classroom Walls." *Technological Horizons in Education*, 8(2), 46.

This paper reports that, by using several features of the *PLATO* computer-aided instruction system, students in Illinois and Hawaii who were taking similar courses were able to communicate with each other and conduct topical discussions through computer conferencing. This technique has a variety of applications, and is available at different sites.

Scollon, S. (1981, December). *"The Teacher-Student Role in Instructional Telecommunications."* Paper presented at the annual meeting of the American Anthropological Association, Los Angeles, California.

Teacher-student classroom relationships and behaviours, at the University of Alaska's Fairbanks campus, are compared with instruction by audioconference and computer conference, with attention to the instruction of Native Alaskan students. Classroom behaviors of Natives and non-Natives are contrasted, particularly with regard to participation and signs of paying attention. Instructors' and students' difficulties with audioconferencing are noted: elimination of all but audio cues; the need to shut out environmental stimuli; problems in obtaining feedback, and lack of the human, personal touch.

Problems with computer conferencing, such as lack of institutional mechanisms for delivering courses in that medium and the large volume of discussion and comments input by instructors and students, are also described. Advantages of the use of instructional telecommunications are brierly discussed, including the fact that the large number of participants can encourage a loose structure in which students can respond to and learn from each other more than would be possible in a lecture hall, and instructors can monitor what occurs without attempting to control it. The paper notes that this mode of teaching requires a radical reconstruction of the teacher-student relationship, in which the teacher is viewed not just as the source of knowledge, but as a facilitator in the exchange of ideas and information.

Seabrook, R. H. (1978). PANALOG: "Shaking the Foundations." Bulletin of the American Society for Information Science, 4(5), 21-22.

PANALOG is a discussion-oriented computer conferencing system developed at the GTE laboratories. Teencom, a version of PANALOG was implemented to help students develop friendships with other students. Several students, from a Washington D.C. school for the deaf, were paired with other students as electronic "pen-pals".

Seamen, J. (Ed.). (1985). "Data Communications: A Manager's View." Hasbrouck Heights, New Jersey: Hayden Book Company.

These articles illuminate the many transitions that have taken place in the field of data communications networks in recent years. Included are important discussions on product development and cost, for anyone involved in the layout and operation of a data communications network. Contents include: electronic mail, microcomputer executive workstations, systems network architecture, distributed data processing, policy, networking, hardware, and cost-cutting measures.

Senders, J. W. (1984, September 4-7). "Design Criteria for the Electronic Journal." In Human-Computer Interaction (1.401-1.403). London, England: International Federation for Information Processing.

An electronic journal must meet the needs and satisfy the expectations of the readers, if it is to succeed. Some reasonable criteria for an electronic journal are derived from consideration of the qualities of a paper journal. None of the requirements can be shown to be impossible to achieve, or to be very much beyond today's state of the art. The author concludes that the electronic journal must give what the paper journal gives, or very nearly so. In compensation for what is lost, it must offer possibilities which are inconceivable with a paper journal. Most presently available personal computers and terminal devices are patently unsuitable for use as the local format of an electronic journal. It would be unfortunate if the advent of the electronic journal were further delayed by rejection of the experimental systems of today, and a consequent slowing of the effort to achieve the necessary formats to obtain reader acceptance.

Sevel, F. (1982). "What If We Gave a Teleconference and Nobody Said Anything?" Online Today, 3(3), 33-36.

The article outlines the applications and functions of teleconferencing primarily through the presentation of anecdotal remarks, and interviews with teleconferencing specialists: Elaine Kerr, Murray Turoff, Miriam Mills, and others. The difference between teleconferencing and bulletin board meetings is articulated. The problems and advantages (especially social/psychological) of initiating a conference are presented.

Shackel, B. (1983). "The BLEND System: Programme for the Study of Some Electronic Journals." Journal of the American Society for Information Science, 34(1), 22-30.

This article describes a three-year experimental programme organized jointly by the two Universities as the Birmingham and Loughborough Electronic Network Development (BLEND). The aims are to assess the cost, efficiency, and subjective impact of such a system, and to explore and evaluate alternative forms of user communication through an electronic journal and information network.

Using a host computer at Birmingham University, a community of about 50 scientists are connected through the public telephone network to explore various types of electronic journal. The concept of the electronic journal involves using a computer to aid the normal procedures whereby an article is written, refereed, accepted, and published. The subject of the experimental programme is "Computer Human Factors". Each member will contribute at least one research article and one shorter note in each year of the project, and will also use other forms of communication, such as newsletters, annotated abstracts, workshop conferences, and cooperative authorship. Throughout the project, relevant data will be gathered to enable the assessment of system and user performance, cost, usefulness, and acceptability.

Sharples, M. (1982). "Educational Technology and the Open University." Teaching at a Distance, 22, 15-20.

Mike Sharples is a research fellow, CYCLOPS project in the Open University's Institute of Educational Technology. Technological innovation does not guarantee educational progress, often the opposite is true - teaching methods are constrained to fit the limitations of the equipment. This article offers some criteria to guide the selection of new technology for distance education. It attempts only to map out a general area of search. The choice of a particular piece of equipment will be determined by more specific features - whether it is for use by students or staff, for formal teaching or informal discussion, for communication, problem solving or information retrieval. The remainder of the article presents a "vision" of two Open University students in the near future, studying at home with the aid of such equipment and, lastly, a strategy to realize such a vision.

Short, J., Williams, E., & Christie, B. (1976). The Social Psychology of Telecommunications. London, England: John Wiley & Sons.

The ways in which people see, hear and sense each other can effect the course and content of interpersonal communication. The importance of the gaze, posture, and other non-verbal cues, is increasingly recognized and studied by both social psychologists and communications specialists. This book was one of the first to describe the social psychological aspects of interpersonal telecommunications. The authors discuss factors that will determine the likely use of the new media, and review research aimed at discovering the effectiveness of the different media for different types of tasks.

Shumada, I. E. (1985, January 22-23). "Experiences With the Design and Implementation of the ENVOY 100 Messaging System." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

Irene E. Shumada is a Computer Systems Specialist with Bell Canada. This paper describes some experiences dealing with the design and implementation of the Envoy 100 messaging system, especially the script and autodelivery capabilities. Numerous enhancements have been added to the system, and have actually been developed using the script and autodelivery capabilities as building blocks. Some of these are the EnvoyPost feature which allows Envoy 100 users to send messages to any mailing address in North America, the design and implementation of a user maintained and billed information database, and the connection of Envoy 100 with the Purolator delivery system. Numerous computer systems are currently connected to Envoy 100. Some of the various interfacing methods are described. Finally, future work in the area of implementation of the new CCITT X.400 series Message Handling Systems Recommendations is discussed. Some of the considerations and possible problems are highlighted.

Smith, H. T. (1982, July 6). "User Issues in Network Communication Systems." Paper presented at a meeting of the International Conference on Man/Machine Systems, Manchester, England.

This paper is concerned primarily with newer variants of textual communication systems - those in which users employ computers as an integral part of the communication to produce, distribute, catalogue and more generally, process messages. The facet examined here is the "importance of human factor issues in the design and use of Computer-Based Message Systems."

Springer, P. G. (1984). "Choosing Your First Bulletin Board." Family Computing, pp. 30, 32.

This description of bulletin board systems (BBS) includes an explanation of the hardware (microcomputer, modem, telephone system), and lists the functions of the BBS itself (i.e., obtaining programs, leaving and receiving messages, ordering products, gathering information, and making social contacts). The article gives complete step-by-step instructions for entering a BBS, and suggests criteria for determining the value of a specific BBS.

Strom, B. I. (1982). "Computer Conferencing: Past, Present, and Future." In N. Naffah (Ed.), Office Information Systems (pp. 287-315). The Hague: North-Holland Publishing Co.

Computer conferencing is a technique for users to confer with each other, usually asynchronously, using a computer to buffer their transcripts. One such computer conferencing system, the Computer Buffered Information Exchange (CBIE) was recently reimplemented to execute under the UNIX operating system, and has been used successfully for a number of conferences at Bell Laboratories. This paper discusses computer conferencing in general, and the Computer Buffered Information Exchange in particular. It contains descriptions of the work of other researchers in the field, a detailed description of computer conferencing and CBIE, and suggestions for future research.

Swart, E. R. (1985 , January 22-23). "Electronic Conferencing: A New Mode of Communication." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

Swart is associate director of the Institute of Computer Science. Certain preliminary reflections on the social and human aspects of electronic conferencing are discussed in the light of actual day-to-day usage, over an extended period of time. It seems likely that its extensive use may well have a profound effect on the flow of information within organizations -- facilitating the lateral transfer of information and altering existing status hierarchies.

Szabo, M. (1984). "International Telecommunications Networks for Computer-Based Learning." Alberta Printout, 5(2), 14-17.

This article examines applications of major telecommunications networks in educational and training environments. Principles, hazards, and recommendations based upon current practice are discussed.

Tanenbaum, A. S. (1981). Computer Networks. Englewood Cliffs, New Jersey: Prentice-Hall.

This book provides a technical overview of computer networking. The introduction provides definitions of what constitutes a computer network, and how they can be used effectively. The remaining chapters describe in detail strategies for designing and implementing each layer of the International Standards Organization (ISO) networking protocol.

"The Use of Satellite Communication for Information Transfer." (1982, February). UNESCO, Paris, France: Report number PGI-82/WS/5.

This study examines the potential of the satellite as carrier of information, in comparison with conventional carriers, and with specialized terrestrial telecommunication networks. The intended audience includes: policy-makers, planners, and specialists responsible for providing and using information services, particularly in the developing countries. The aim of the study was to provide practical guidance on the various options and methods in this field.

Thorngate, W. (1985, January 22-23). "Social Psychology and the Design of Computer Conferencing Systems." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

Thorngate is associate professor of psychology, Carleton University. Problems of computer conferencing can be divided into those concerned with the medium, and those concerned with the users of the medium. The former are likely to be alleviated by future developments in hardware, software, and funding. The latter are less likely to be alleviated, but the probabilities of their alleviation will be increased by considering the social and psychological constraints of users, and attempting to develop norms, traditions, and rewards for effective participation based upon these considerations. Examples of user constraints and the problems arising from them are given; methods of circumventing them are discussed.

Tombaugh, J. W. (1985, January 22-23). "Reactions of Scientists to the Structure and Content of an International Computer-Based Conference." Paper presented at the Workshop on Computer Conferencing and Electronic Mail meeting of the Institute of Computer Science, University of Guelph, Guelph, Ontario.

Tombaugh is at Carleton University, Psychology Department. Scientists who participated in a computer-based conference were asked to comment on the technology itself and on the scientific value of the exercise. While 78% of the 97 respondents indicated that they would participate in other computer-based conferences, they also identified improvements that they would like to see. There was particular concern about the lack of contribution by participants, the quality of the information that was presented, and an absence of focus or direction to the conference. Some of the difficulties would be minimized by changing features of the conferencing system. Recommendations for future conferences are made, based on the problems identified by the participants. Many of the problems require social, not technical solutions.

Tracz, G. (1980). "Computerized Conferencing: An Eye-Opening Experience With EIES." The Canadian Journal of Information Science, 5(May), 11-20.

Developments in communications technology are reinforcing the continuing transformation of the Industrial Society into the Information Society. The author focuses on computerized conferencing, one mode of exchange of information between scholars and researchers, and describes his personal experiences with the Electronic Information Exchange System (EIES). Particular attention is paid to the psychological aspects of computerized conferencing, the tensions between the smothering sensation of information overload on one hand, and the liberating lift of collective intelligence on the other. The paper concludes with a plea for general fluency with the new literacy of the 1980's -- communications and computer technology.

Vallee, J. (1982). The Network Revolution. Berkeley, California: And/Or Press, Inc.

The Network Revolution examines the human aspects of computer technology. Vallee, a computer scientist and one of the early insiders in computer conferencing, demystifies the technology, and discusses its impact on the present and future. Vallee focuses on human power and control with respect to the technology which, he argues, has the potential to enhance or degrade the quality of human life.

Waniewicz, I. (1982). "The Adult Learners: Who Are They? Why and Where Do They Learn?" In J. Daniel, M. Stroud, & J. Thompson (Eds.), Learning at a Distance: A World Perspective (pp. 87-89). Edmonton, Alberta: Athabasca University.

In this article, the author argues that surveys of potential adult learners indicate that there is an enormous market that could be served by the techniques of distance education. The impact of demographic, social and technological change on the educational needs of adults is enormous, and Waniewicz examines existing data on characteristics of adult learners (and their future needs) to indicate the potential of distance education.

Williges, R. C., et al. (1984, September 4-7). "Providing On-Line Assistance to Inexperienced Computer Users." In Human-Computer Interaction (2.113-2.117). London, England: International Federation for Information Processing.

Inexperienced users of interactive computer systems often need online assistance to complete their task successfully. The results of several research studies are reviewed, as a means of specifying the human-factors design considerations for online assistance. Alternatives such as automatic error detection, browsing and comparison of help facilities, and online expert aiding need to be considered. It was concluded that these features need to be incorporated into an adaptive interface, and tailored to the specific needs of the inexperienced user of the software interface.

Winn, B. Ellis, G. B., & Sinkey, L. (1983, March). "The Application of Integrated Videotex and Teleconferencing Technologies for Distance Education Involving the Use of a Mini-Computer With Complex Graphic Capabilities." Paper presented at the International Conference on the Application of Mini- and Micro-Computers in Information, Documentation and Libraries, Tel Aviv, Israel. Meeting of the IEEE.

Winn, Ellis & Sinkey are at the University of Calgary, Alberta. The paper reports the progress to date of a project to develop and test a computer-based information system in which Canada's videotex system, Telidon, is integrated with audio

teleconferencing. The system is designed specifically to deliver credit courses to students, precluding their attendance on campus. Additionally, the system will have applicability to the distribution of information over a network for any purpose whatsoever, where text, graphics data and audio are required. As the project is not completed, the paper is not a "final report." Nonetheless, it contains a considerable amount of information about the system and its effectiveness, the components of the system (teleconferencing and Telidon), the way in which they have been integrated, field trial data, and speculation on the impact of this and similar systems on higher education, in particular, and society in general.

Wrightsman, L.S. & Deaux, K. (1981). Social Psychology in the '80s (Third ed.). Monterey, California: Brooks/Cole Publishing Company.

This is a comprehensive book that integrates the development of constructs and methodology with our needs, as social beings, to understand the phenomena around us. Included are topics that are traditional in social-psychological research including: social perception, attitudes and attitude change, aggression, prejudice, prosocial behaviour, and group dynamics. There are also chapters devoted to aspects of communication, which include both verbal and nonverbal aspects, and the interaction process that communication implies.

Zemke, R. & Zemke, S. (1981). "30 Things We Know for Sure About Adult Learning." Training, 18(6), 45-52.

The article classifies knowledge of adult learners into three major categories: (1) characteristics of adult motivation; (2) curriculum design considerations; and (3) effective classroom practice. Adult motivation is generated by a need to find new means of coping with specific life-changes. Most adults see learning as a means, not an end in itself. Consequently, curriculum must be designed in such a way that the learner perceives the information as useful. Adult learners prefer single-concept/single-theory courses over survey courses. Classroom practice should use the adult learners' extensive and diverse experiences as a framework for acquiring new knowledge.

Zinn, K. (1981). "CONFER Connection." Creative Computing, 7(4), 98-102.

Details are given of the Michigan Terminal System (MTS), an electronic bulletin board viewed to go well beyond the capabilities of the typical micro-based community bulletin board system. Descriptions of the hardware and software include the development of the CONFER program and summaries of 6 applications. One application (support of an international congress held recently in Ann Arbor), is described in detail.